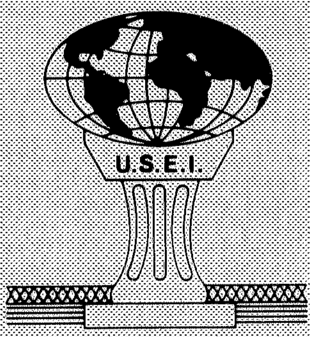

SOIL AND FOUNDATION INVESTIGATION
for
SAN TOMAS AQUINO CREEK IMPROVEMENTS
SANTA CLARA, CALIFORNIA

UNITED SOIL ENGINEERING
CONSULTING ENGINEERS and GEOLOGISTS

1.4.694

REPORT

to

SANTA CLARA VALLEY WATER DISTRICT

SAN JOSE, CALIFORNIA

on

SOIL AND FOUNDATION INVESTIGATION
for
SAN TOMAS AQUINO CREEK IMPROVEMENTS
SANTA CLARA, CALIFORNIA

by

UNITED SOIL ENGINEERING, INC.

3476 EDWARD AVENUE

SANTA CLARA, CALIFORNIA

OCTOBER 1980

U.S.E.I.

UNITED SOIL ENGINEERING, INC.

Soil, Foundation and Geological Engineers

3476 EDWARD AVENUE, SANTA CLARA, CALIFORNIA 95050 (408) 988-2990

File No. 80-2016-S1
October 21, 1980

Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Attention: Mr. David McNeely

Subject: San Tomas Aquino Creek Improvements
Santa Clara, California
SOIL AND FOUNDATION INVESTIGATION

Gentlemen:

We are pleased to transmit herewith the results of our soil, foundation and geotechnical investigation performed for the planned improvements of San Tomas Aquino Creek from 680 feet upstream of the confluence with Saratoga Creek to Bayshore Freeway in Santa Clara, California.

The accompanying report presents our findings in the literature review, subsurface investigation, laboratory analyses and our recommendations and conclusions based on these findings.

If you have any questions or require additional information, please feel free to contact our office at your convenience.

Very truly yours,

UNITED SOIL ENGINEERING, INC.

Kendall W. Pr

Kendall W. Price
Project Engineering Geologist

Max M. Gahrahmat /lm

Max M. Gahrahmat, P.E.

KWP:MMG/lm

Copies: 12 to Santa Clara Valley Water District

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File No. 80-2016-S1

SOIL INVESTIGATION

Purpose and Scope

The purpose of the soil investigation on the proposed San Tomas Aquino Creek improvements in Santa Clara, California, was to determine the conditions of the surface and near-surface soil, and, based on the conditions revealed by the investigation, to report the soil load bearing values and foundations suitability for the modification of the existing lined sections, construction of new lined channel and excavation recommendations for earth channel sections. These recommendations are based on the preliminary channel cross sections provided for our use by the Santa Clara Valley Water District. To aid in locating our exploratory borings with respect to the existing right of ways and utility location, the Santa Clara Valley Water District provided us with plan and profile drawings of the San Tomas Aquino Creek improvement sections. The work performed consists of a field investigation, a laboratory testing program, analysis of the field and laboratory data, review of existing data presented to us by the district, and the preparation of this report.

Location and Description

The investigated section of San Tomas Aquino Creek begins 680 feet upstream (south) of the confluence with Saratoga Creek and extends downstream (north) to the Bayshore Freeway in Santa Clara, California. Our borings were located on the berms to the east and west of the channel alignment. The enclosed site plan, Figure 1 shows our exploratory boring location with respect to the alignment of San Tomas Aquino Creek.

Field Investigation

The field investigation was performed at the project site on August 22, 28 and September 29, 1980, by the Project Engineering Geologist. A total of 13 borings were drilled to depths from 30 to 35 feet (9.1 to 10.7 m.), below the existing embankment surface. A truck-mounted drill rig with power driven 6-inch (15 cm.) diameter continuous flight augers was used. The soils encountered were logged continuously in the field during the drilling operations. Relatively undisturbed subsurface soil samples were obtained by hydraulically pressing a 2½-inch (6.4 cm.) O.D. split-tube sampler 18 inches (46 cm.) into the natural ground at various depths. The samples of the denser subsurface soil was obtained by hammering the split-tube sampler 18 inches into the ground. A 140-pound (63.6 kg.) with a free fall of 30 inches (76 cm.) was used to advance the sampler. Blow counts were recorded on each 6-inch increment of the sampled interval. This test method is designated as ASTM D1587, Thin-Walled Tube Sampling of Soils, which is at variance to ASTM D1586 Penetration Test and Split-Barrel Sampling of Soils. Penetration resistance (n) as shown on the boring logs represents the number of blows required to drive the sampler the last 12 inches of the sampled depth. Table II corroloates the blows required to drive the 2½ inch outside "California Sampler" (ASTM D1587) to the 2 inch outside diameter of the "Tergaghi Sampler" (ASTM D1586). Penetration resistance data was also used to evaluate the liquefaction potential of the soils encountered within the water table. A discussion of liquefaction is presented in a following section of this report. Figures 2 through 4 Logs of Test Borings, are a graphic representation of the soil profile and the locations and depths at which the samples were obtained. In addition, a disturbed near-surface bulk sample of the near-surface soil was collected for laboratory analyses.

Soil Conditions

The soils at the site are relatively uniform, having for the most part been deposited in nearly horizontal layers. The tops of the berms east and west of the channel have been overlaid with fill and baserock. This has a thickness of about 3 feet.

Below this fill area the soil consists of a medium brown to dark brown silty clay with scattered fine sands. This material was found to be very moist and very stiff. At a depth of about 7 to 8 feet (2.1 to 2.4 m.) a yellow brown to light brown silty clay horizon was encountered and extends to the approximate water table depth. This material was found to have some small quantities of scattered fine sand and gravel. At the bottom of this stratum the water table was encountered. The water bearing zone generally consists of a sandy silty clay with scattered gravels. In some borings (B-4, B-7 and B-9) the water bearing zone consisted of a clayey sandy gravel. At these locations we experienced caving on the order of 3 to 8 feet (1 to 2.4 m.) in this relatively cohesionless material. Below this stratum, and extending to the bottom of the explored columns, was a blue gray slightly sandy silty clay. This material was very stiff and moist. A detailed description of the soils encountered during our field drilling can be found in Figures 2 through 4 Appendix "A". Also shown in Appendix "B" are Boring Logs and test data of adjacent projects located to the east and west of the San Tomas Aquino Creek improvement section.

Laboratory Investigation

A laboratory testing program was performed and directed toward a quantitative determination of the physical and engineering properties of the soil underlying the site. All the relatively undisturbed soil samples were tested for moisture content and dry density, in order to determine the consistency of the soil and the moisture variation throughout the explored soil profile. Simple direct shear and unconfined compression tests were performed on selected soil samples to evaluate the strength characteristics of the soils for the foundation suitability report. The sample for direct shear was placed in water for a minimum of 24 hours prior to testing, and then sheared under undrained conditions at loads of 1, 2, 3 and 4 kips (.5, .9, 1.4 and 1.8 metric tons). Samples that were retrieved from the proposed bottom location in borings 11 through 13, were analysed for strength parameters. Other direct shear and unconfined compression tests were performed on soils that would constitute a "worst case" condition. The results of these tests were used in our analysis of settlement and slope stability. In addition near-surface bulk samples were also obtained for laboratory analysis. Results of the laboratory tests are presented in Table I and Figures 5 through 12 of Appendix "A".

Representative samples of on-site fill material were not obtained. Uncontaminated samples could not be obtained from the drill holes. These samples would best be recovered when grading begins. Compaction tests could then be performed on the representative samples in the field during the grading operation.

To further evaulate the consolidation potential of the subsurface soil, one consolidation test was performed at the bottom of the deep structure located at Station 69+27. The results of this test are discussed under the settlement section of this report. The consolidation curve can be found on Figure 14.

Liquefaction

Moderate to high blow counts recorded at levels where sand with clay binder, sand and gravels, or sandy clays indicated compacted and moderately dense materials. Therefore, liquefaction - the transformation of clean, loose confined sand layers under vibratory laods such as earthquakes cause - is unlikely at the site as no soft or loose granular layers were encountered. Because no soft or loose, granular sedimentary materials, - those generally considered liquefiable - were found by us in the course of our investigation, nor any soft cohesive soils, we believe there is a very low to no potential for liquefaction, lurching, or settlement due to earthquakes at the site. (See Liquefaction Potential Graph, Figure 13)

To further evaluate the unlined sections of the channel, gradation analysis and Atterberg Limits tests were performed on samples taken at various depths within borings 11, 12 and 13.

CONCLUSIONS

1. That portion of San Tomas Aquino Creek covered by this investigation is suitable for the proposed improvements provided the recommendations contained in this report are carefully incorporated into the final plans and specifications.

RECOMMENDATIONS

Grading-Cleaning and Soil Suitability

1. The placement of fill and control of any grading operations at the site should be done in accordance with the recommendations of this report. These recommendations set forth the minimum standards to satisfy other requirements of this report.

2. Prior to the commencement of any grading operations the channel should be cleared of all vegetation, concrete and asphalt debris. A majority of the unlined channel bottom has a very heavy growth of shrubs, grasses and weeds. Also many sections of the channel embankment slopes have been covered with asphalt and concrete slab debris. It appears that this material was placed as a measure to reduce embankment erosion during periods of heavy rain. This material is unsuitable as engineered fill and should be hauled from the site prior to any grading. The vegetation at the site is concentrated in areas that are; a) unlined or b) lined, but sediments have been deposited on the concrete over the years. Virtually the entire section of the explored creek channel bottom is currently supporting vegetation of one type or another. All this vegetation and associated debris should be cleared away. The remaining organic material (i.e. near-surface root zone soil associated with the vegetation) should be stripped to a depth of approximately 6 inches below the existing channel bottom.

3. Our field borings did not reveal any naturally deposited soils that would be unsuitable for the reconstruction project. However, the baserock that has been used to surface the maintance roads could then be salvaged and used to surface the new maintance roads.

4. In reviewing the proposed creek sections it has been concluded that engineered fill will be required between stations 61+00 and 68+95 (typical Section "E"). Also smaller quantities of fill will also be placed between

stations 71+00 and 81+00 (Typical Section "F"). We recommend that all the engineered fill be placed in accordance with the following recommendations.

5. After all organic material has been removed a base key should be excavated at the toe of the fill section. This base key should have a minimum width of 10 feet and extend past the fill sections by a minimum of 10 feet in both directions.

The key should have a minimum slope of 2% into the existing embankment slope. At this point the area is ready to receive engineered fill. The natural ground should be properly moisture conditioned prior to compaction and placement of additional fill. If the ground is dry it should have water added so that the moisture content is ±2% of laboratory optimum. If the soil is too wet it should be allowed to dry until the moisture content is ±2% of the laboratory optimum. When this moisture condition is obtained the natural ground should be compacted to not less than 90% relative compaction in accordance with ASTM test procedure D1557-70. At this point the fill areas will be ready to receive additional fill. Fill material should be brought to the proper moisture content in the same manner as previously described for the natural ground. As fill is being placed, consecutive benches should be cut into the existing embankment slope. This step will better bond the fill to the natural ground. When fill is to be placed on top of the levee embankment, the existing baserock section should be removed and stockpiled for later use. The then exposed ground surface should be scarified to a depth of 6 to 8 inches, moisture conditioned as necessary (i.e. if too wet it should be dried, if too dry water should be added) and compacted to 90% relative compaction in accordance with ASTM test procedure D1557-70. Water should be properly mixed to insure proper compaction. Fill should be placed in 6 to 8 inch lifts and compacted to not less than 90% relative compaction. As fill is being placed consecutive benches should be cut in the existing slope. This step will better incorporate the fill with natural ground. When fill is to be placed on top of the levee embankment the existing baserock road section should be removed and stockpiled. The then exposed natural ground should be scarafied to a depth of 6 to 8 inches and recompacted to 90% relative compaction in accordance with ASTM test procedure D1557-70. A diagram of the slope, compaction procedure can be found in Figure 15.

6. When fill material contains large quantities (greater than 70%) of sand and gravel we recommend that it be mixed with less granular material. This will increase the cohesion of the soil and make a more suitable finished slope for the

embankment fill areas. When on-site soils are mixed, a minimum of 30% clay will be necessary for embankment fill material.

Settlement

7. Anticipated settlement at the project site can be separated into two catagories: a) channel bottom and b) top of the embankments. Our analysis was therefore, concerned with the two proposed deep structures located at Station 25+82 and Station 69+27.

To determine the amount of total settlement and differential settlement, our analysis included an evaluation of our consolidation test with respect to the proposed deep structure. Our analysis indicates that total settlement of the channel bottom is on the order of 1 to 2 inches, with a maximum differential settlement of ½ an inch over a horizontal distance of 50 feet. We anticipate that approximately 80% of the settlement will be eliminated during the heavy construction phase of the project. We feel that this degree of settlement will not cause major problems with the proposed facilities. However, to further reduce the potential of structural settlement we recommend that 2 feet of native soil be over-excavated at the foundation areas. This excavation should then be backfilled with a baserock-type material and compacted to 95% relative compaction. Our settlement analysis was performed on the worst case condition that is expected at the site.

An evaluation of the cross-section for the embankments indicates that no structural fill is to be placed on top of the existing embankment. In some locations (i.e. Stations 29+00, 28+00, 31+00, 36+00 and 42+02) the embankment top will be reduced in width due to the widening of the channel bottom. Due to these facts, settlement of the embankments are negligible.

Shrinkage and Expansion of On-Site Soils

8. There are many factors that will determine the shrinkage value of the onsite soils. These factors include the time of year that construction begins, natural moisture content, location of excavated soils (i.e. channel bottom or top of levee) and amount of clay in the soil. When soils are excavated from the channel bottom to an elevation of 5 to 7 feet above the bottom, we anticipate the shrinkage to be on the order of 20 to 25%. This is due to the high moisture content and moderate consolidation of the soils at this elevation. When soils are excavated from near the top of the levee embankment, shrinkage will be on the order of 5%.

9. Our tests and evaluation of on-site samples and those of the surrounding area indicates that soils have a moderate expansion potential. The expansion potential has been measured on soils which by visual inspection, appear to have the highest possible expansion on the site. Therefore, when this soil is used as engineered fill, it will be mixed with less expansive soil tending to even further decrease the plasticity of the soils.

Weep Hole Filter Material

10. In our exploratory borings numbered four, seven and nine, we encountered water bearing strata that consisted of sands and gravels with minor clay binder. The depth that this material was encountered ranged from 15 to 25 feet below the existing top of the embankment elevation. This material was found not to conform to permeable filter material specifications as stated in Caltrans Standard Specification Manual. This is based on a gradation test performed on sample 5-3 and shown on Figure 7. The excavation of this soil for use as drainage material would, we feel, present a large construction problem. The existing embankment top would be lowered 12 to 15 feet to provide access to the potential drainage material. The lateral extent of the excavation would be quite large. The stability of off-site, adjacent facilities would be in question. The slope would then have to be reconstructed with import material to compensate for the excavated material. It is our opinion that less expense and time delays would be incurred if Class II filter material was used. This material should conform to Caltrans Specifications section 68-1.025. If the Class II drain rock is used, we do not consider piping to be a problem since we will have a water head of less than 2 feet. However, the placement of a filter fabric material would be relatively inexpensive and would assure that no loss of fines would occur.

Dewatering During Construction

11. There are several methods suitable for dewatering the site to make a more desirable construction environment. We highly recommend that work should be performed during that portion of the year when water flow is at its lowest.

12. The construction of a coffer dam up stream of work areas would be the most suitable method for dewatering. When a coffer dam is constructed the water can be diverted along the edges of the channel via a flume, steel pipe or a shallow trench filled with drain rock. The trench will keep the water controlled laterally while the rock will allow work to proceed without getting wet.

13. An alternate method would be to prepare a trench excavation at the center of the creek, below the bottom of the construction area. The trench would be backfilled with drain rock to maintain a suitable construction environment.

14. Another alternate would be the use of a well-point dewatering system. This system would lower the surrounding ground water table and subsequently the creek elevation. This system is probably the least desirable since it would require more than one well in each construction location.

Trench Excavation

15. On the basis of our engineering reconnaissance and exploratory borings, it is our opinion the trenches on the top of the levee embankment may be excavated to a depth of 5 feet without shoring. However, when trenches are excavated in the channel bottom, care should be taken. Since, at this elevation gravels may be encountered, shoring may be required in trenches less than 5 feet deep. Under no condition should trenches be excavated deeper than 5 feet without proper shoring. This is an OSHA requirement.

Retaining Walls

16. Any facilities that will retain a soil mass, such as retaining walls or drop structure walls, should be designed for a lateral earth pressure (active) equivalent to 55 pounds (25 kg.) equivalent fluid pressure, plus surcharge loads. If the retaining walls are restrained from free movement at both ends they shall be designed for the earth pressure resulting from 65 pounds (29.5 kg.) equivalent fluid pressure, to which should be added the surcharge loads. The Structural Engineer should discuss the surcharge loads with the Soil Engineer prior to designing the retaining walls.

17. In designing for allowable resistive lateral earth pressures (passive), 280 pounds (127 kg.) equivalent fluid pressure may be used with the result acting at the third point.

18. A coefficient of friction of .3 may be used for the retaining wall design.

19. The above values assume a drained condition, and a moisture content compatible with those encountered during our investigation. To promote proper drainage, a layer of at least 1 foot (.3 m.) of gravel or drain rock should be placed between the facility and the retained material. Either weep holes or perforated pipes (perforations down) should be included in the design to conduct water from behind the retaining structure. The drain rock should extend to within 12 inches of the top of the retaining structure. Filter fabric should then be

placed on top of the rock and native soil then placed on top of the filter fabric and extending to the top of the structure.

20. Retaining wall footings should be set at a minimum depth of 18 inches (46 cm.) with a level front ground surface, or at a minimum of 24 inches (61 cm.) from a sloping ground surface on the front side. The allowable bearing capacity is 1,500 p.s.f. (7.3 metric tons/sq. m.) for construction at the creek bottom, or 2220 p.s.f. (10.7 metric tons/sq. m.) allowable bearing capacity when construction is not performed within the bottom of the channel.

Slope Stability Analysis

21. In preparing our slope stability analysis, we utilized the strength results obtained from direct shear and unconfined compression performed on samples at or near the proposed bottom of the channel. The results of these tests were then used in our method of slices analysis. Our test results were taken from a "worst case" sample and then plugged into the analysis. A safety factor of 1.5 has been used in our stability calculations. A copy of this analysis is presented in the back of this report for your review.

22. Our slope stability analysis indicates that all unlined fill slopes may be constructed at a 2:1 (horizontal to vertical) slope with a maximum vertical extent not exceeding 17 feet. At this point a 15 foot wide bench should be constructed. The maximum vertical extent may be exceeded if anyone of the following factors are incorporated in final plans: 1) placement of rip-rap at top of slope, then the maximum vertical extent can be measured from the top of the erosion control material, b) lining of the lower portion of the slopes and channel bottom, c) reconstruct slopes with a 6 to 7 foot high retaining wall at the toe of the slope, or d) at an access road traverses the slope, the toe of the slope may begin at the road elevation.

23. Cut slopes may be constructed at a 1½:1 (horizontal to vertical) slope with a maximum vertical extent not exceeding 17 feet. If the slopes are inclined at a slope of 2:1 (horizontal to vertical) the slope may be increased to 23 feet (vertically). If the slopes are lined they may exceed our allowable maximum section. Our firm should review the final section plans for the channel improvements.

Erodability and Erosion Control of Channel Soils

24. The unlined portions of the creek should be protected from erosion.

During our laboratory investigation we performed grain size analysis on the coarse fraction of our sample, and Atterberg Limits tests on the fine fraction of our sample. Our analysis indicates that samples were generally fine-grained with low to intermediate plasticity (PI's 10 to 21). The results of the Atterberg Limits tests can be seen in Figures 5 and 6. Upon visual examination of the existing unlined channel bottom, we found only minor channel widening into the channel slopes. This widening generally occured 2 to 4 feet above the bottom of the channel and only undercut (eroded) the slopes 1 to 2 inches into it's face. We consider this erosion to be small, but we recommend that the slopes be protected. The slope protection need not necessarily extend up the embankment to the 100 year water level; however, it should extend to an elevation that will allow protection from the majority of the storm water discharge during the rainy season. One type of slope rip-rap that might be used is the 200 pound rip-rap as described in Section 72-2.01 of the Caltrans Standard Specification manual. The rip-rap should be placed a minimum of 2 feet below the proposed bottom and 2 feet into the proposed embankment slope. The addition of a woven filter fabric on the slope face would be a relatively inexpensive procedure that would minimize the loss of fine-grained material in areas where low clay content exists. The precise location and extent of this fabric would be determined after the channel bottom and slopes have been reconstructed.

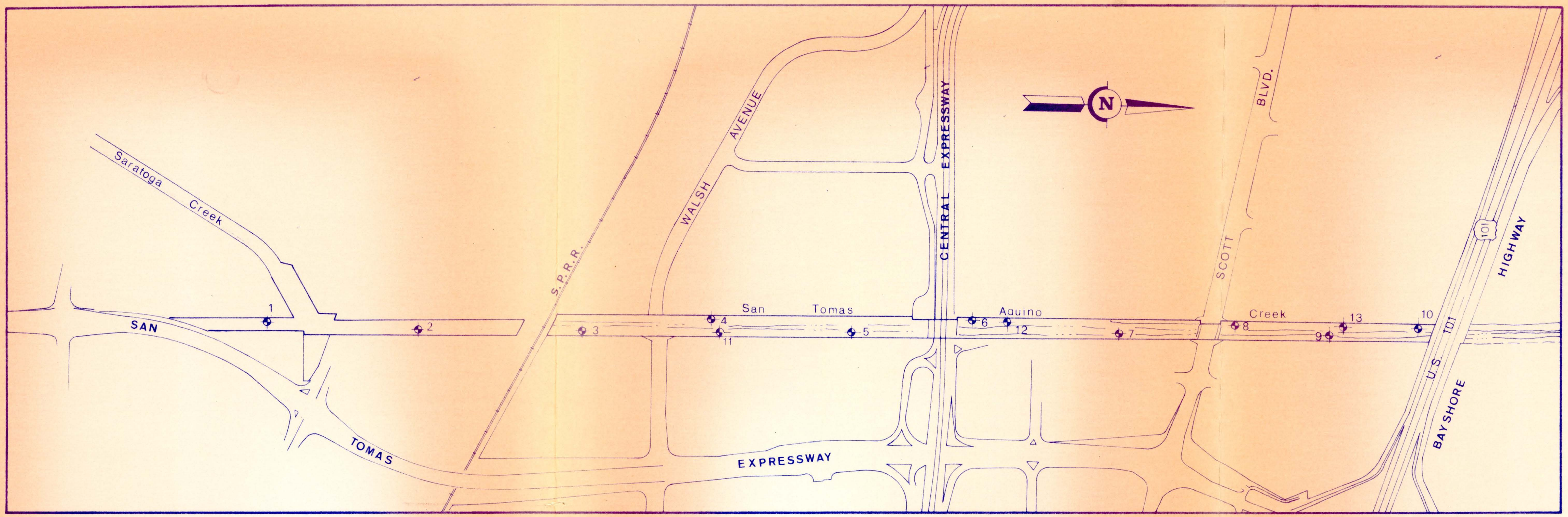
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations presented herein are based on the soil conditions revealed by our test borings and evaluated for the proposed construction planned at the present time. If any unusual soil conditions are encountered during the construction, or if the proposed construction will differ from that planned at the present time, United Soil Engineering, Inc. should be notified for supplemental recommendations.

2. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the necessary steps are taken to see that the Contractor carries out the recommendations of this report in the field.

3. The findings of this report are valid as of the present time. However, the passing of time will change the conditions of the existing property due to natural processes, works of man, from legislation or the broadening of knowledge. Therefore, this report is subject to review and should not be relied upon after a period of three years.

APPENDIX "A"



SITE PLAN

SAN TOMAS - AQUINO CREEK

SANTA CLARA, CALIFORNIA

Figure 1

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(408) 988-2990

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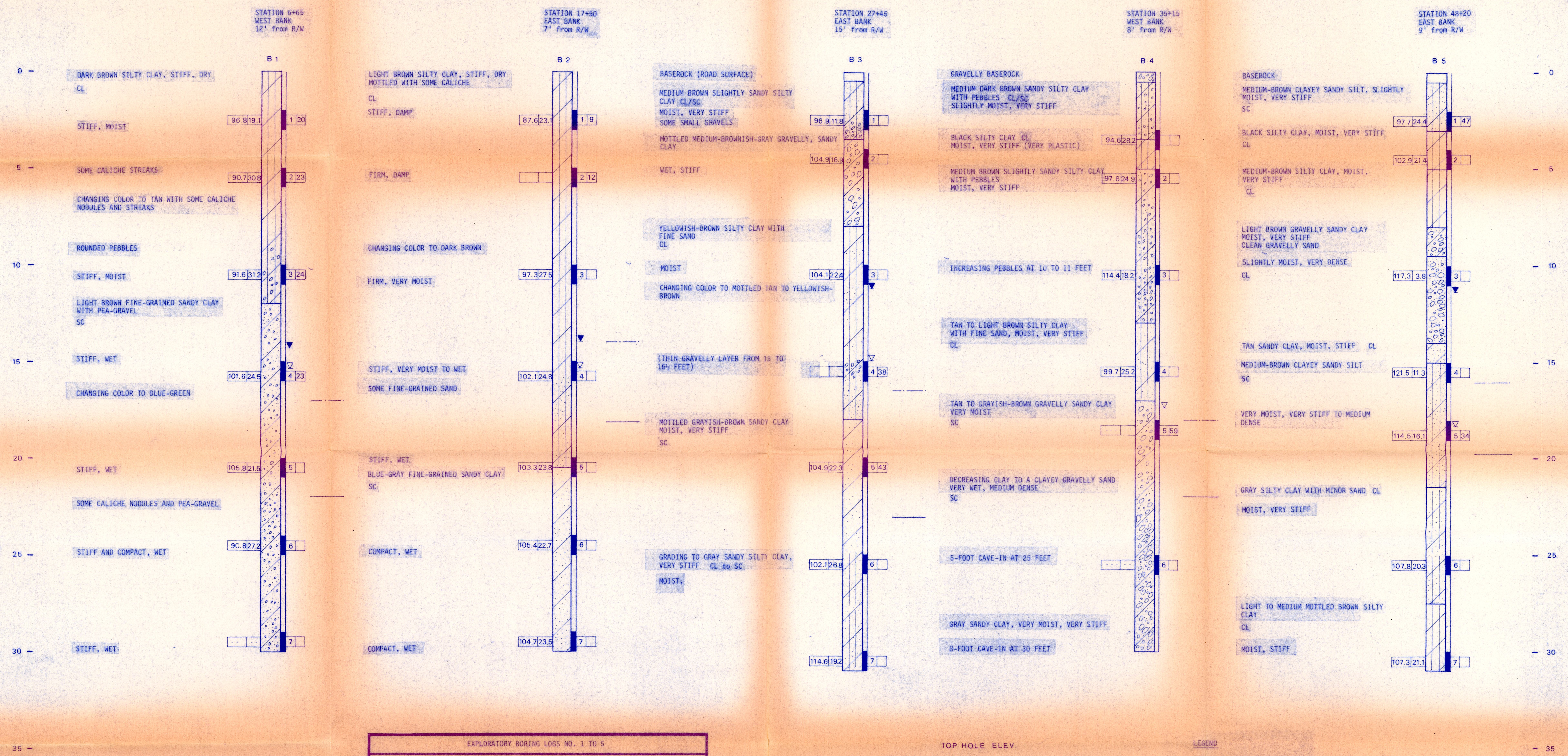
0
5
10
15
20
25
30
35
STATION 6+65
WEST BANK
12' from R/W
B 1
DARK BROWN SILTY CLAY, STIFF, DRY
CL
STIFF, MOIST
96.8 19.1 1 20
SOME CALICHE STREAKS
90.7 30.8 2 23
CHANGING COLOR TO TAN WITH SOME CALICHE NODULES AND STREAKS
ROUNDED PEBBLES
STIFF, MOIST
91.6 31.2 3 24
LIGHT BROWN FINE-GRAINED SANDY CLAY WITH PEA-GRAVEL
SC
STIFF, WET
101.6 24.5 4 23
CHANGING COLOR TO BLUE-GREEN
STIFF, WET
105.8 21.5 5
SOME CALICHE NODULES AND PEA-GRAVEL
STIFF AND COMPACT, WET
9C.8 27.2 6
STIFF, WET
-- -- 7
STATION 17+50
EAST BANK
7' from R/W
B 2
LIGHT BROWN SILTY CLAY, STIFF, DRY MOTTLED WITH SOME CALICHE
CL
STIFF, DAMP
87.6 23.1 1 9
FIRM, DAMP
2 12
CHANGING COLOR TO DARK BROWN
FIRM, VERY MOIST
97.3 27.5 3
STIFF, VERY MOIST TO WET
SOME FINE-GRAINED SAND
102.1 24.8 4
STIFF, WET
BLUE-GRAY FINE-GRAINED SANDY CLAY
SC
103.3 23.8 5
COMPACT, WET
105.4 22.7 6
COMPACT, WET
104.7 23.5 7
STATION 27+45
EAST BANK
15' from R/W
B 3
BASEROCK (ROAD SURFACE)
MEDIUM BROWN SLIGHTLY SANDY SILTY CLAY CL/SC
MOIST, VERY STIFF
SOME SMALL GRAVELS
96.9 11.8 1
MOTTLED MEDIUM-BROWNISH-GRAY GRAVELLY, SANDY CLAY
104.9 16.9 2
WET, STIFF
YELLOWISH-BROWN SILTY CLAY WITH FINE SAND
CL
MOIST
104.1 22.4 3
CHANGING COLOR TO MOTTLED TAN TO YELLOWISH-BROWN
(THIN GRAVELLY LAYER FROM 15 TO 16½ FEET)
4 38
MOTTLED GRAYISH-BROWN SANDY CLAY MOIST, VERY STIFF
SC
104.9 22.3 5 43
GRADING TO GRAY SANDY SILTY CLAY, VERY STIFF CL to SC
MOIST,
102.1 26.8 6
114.6 19.2 7
STATION 35+15
WEST BANK
8' from R/W
B 4
GRAVELLY BASEROCK
MEDIUM DARK BROWN SANDY SILTY CLAY WITH PEBBLES CL/SC
SLIGHTLY MOIST, VERY STIFF
BLACK SILTY CLAY CL
MOIST, VERY STIFF (VERY PLASTIC)
94.6 28.2
MEDIUM BROWN SLIGHTLY SANDY SILTY CLAY WITH PEBBLES
MOIST, VERY STIFF
97.8 24.9 2
INCREASING PEBBLES AT 10 TO 11 FEET
114.4 18.2 3
TAN TO LIGHT BROWN SILTY CLAY WITH FINE SAND, MOIST, VERY STIFF
CL
99.7 25.2 4
TAN TO GRAYISH-BROWN GRAVELLY SANDY CLAY
VERY MOIST
SC
--- -- 5 59
DECREASING CLAY TO A CLAYEY GRAVELLY SAND
VERY WET, MEDIUM DENSE
SC
5-FOOT CAVE-IN AT 25 FEET
--- -- 6
GRAY SANDY CLAY, VERY MOIST, VERY STIFF
8-FOOT CAVE-IN AT 30 FEET
STATION 48+20
EAST BANK
9' from R/W
B 5
BASEROCK
MEDIUM-BROWN CLAYEY SANDY SILT, SLIGHTLY MOIST, VERY STIFF
SC
97.7 24.4 1 47
BLACK SILTY CLAY, MOIST, VERY STIFF
CL
102.9 21.4 2
MEDIUM-BROWN SILTY CLAY, MOIST, VERY STIFF
CL
LIGHT BROWN GRAVELLY SANDY CLAY
MOIST, VERY STIFF
CLEAN GRAVELLY SAND
SLIGHTLY MOIST, VERY DENSE
CL
117.3 3.8 3
TAN SANDY CLAY, MOIST, STIFF CL
MEDIUM-BROWN CLAYEY SANDY SILT
SC
121.5 11.3 4
VERY MOIST, VERY STIFF TO MEDIUM DENSE
114.5 16.1 5 34
GRAY SILTY CLAY WITH MINOR SAND CL
MOIST, VERY STIFF
107.8 20.3 6
LIGHT TO MEDIUM MOTTLED BROWN SILTY CLAY
CL
MOIST, STIFF
107.3 21.1 7

EXPLORATORY BORING LOGS NO. 1 TO 5

SAN TOMAS AQUINO CREEK IMPROVEMENTS

SANTA CLARA, CALIFORNIA

Figure 2

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Date: 9-12-80
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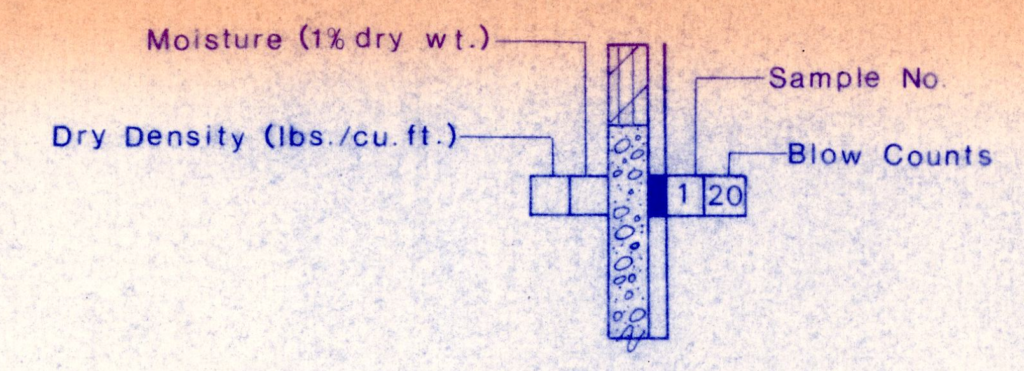
Scale: 1" = 2½'
Job No.: 80-2016-S1

TOP HOLE ELEV.



FLIGHT AUGER
SAMPLE DIA. = 2.5'

LEGEND

—·— = Existing Bottom Line
—— = Proposed Bottom Line
▽ = Water Table

REV.	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES

DATE
DESIGN
DRAWN
CHECKED

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
ENGINEERING APPROVAL

SCALE
SHEET

EXPLORATORY BORING LOGS NO. 11 TO 13

SAN TOMAS AQUINO CREEK IMPROVEMENTS

SANTA CLARA, CALIFORNIA

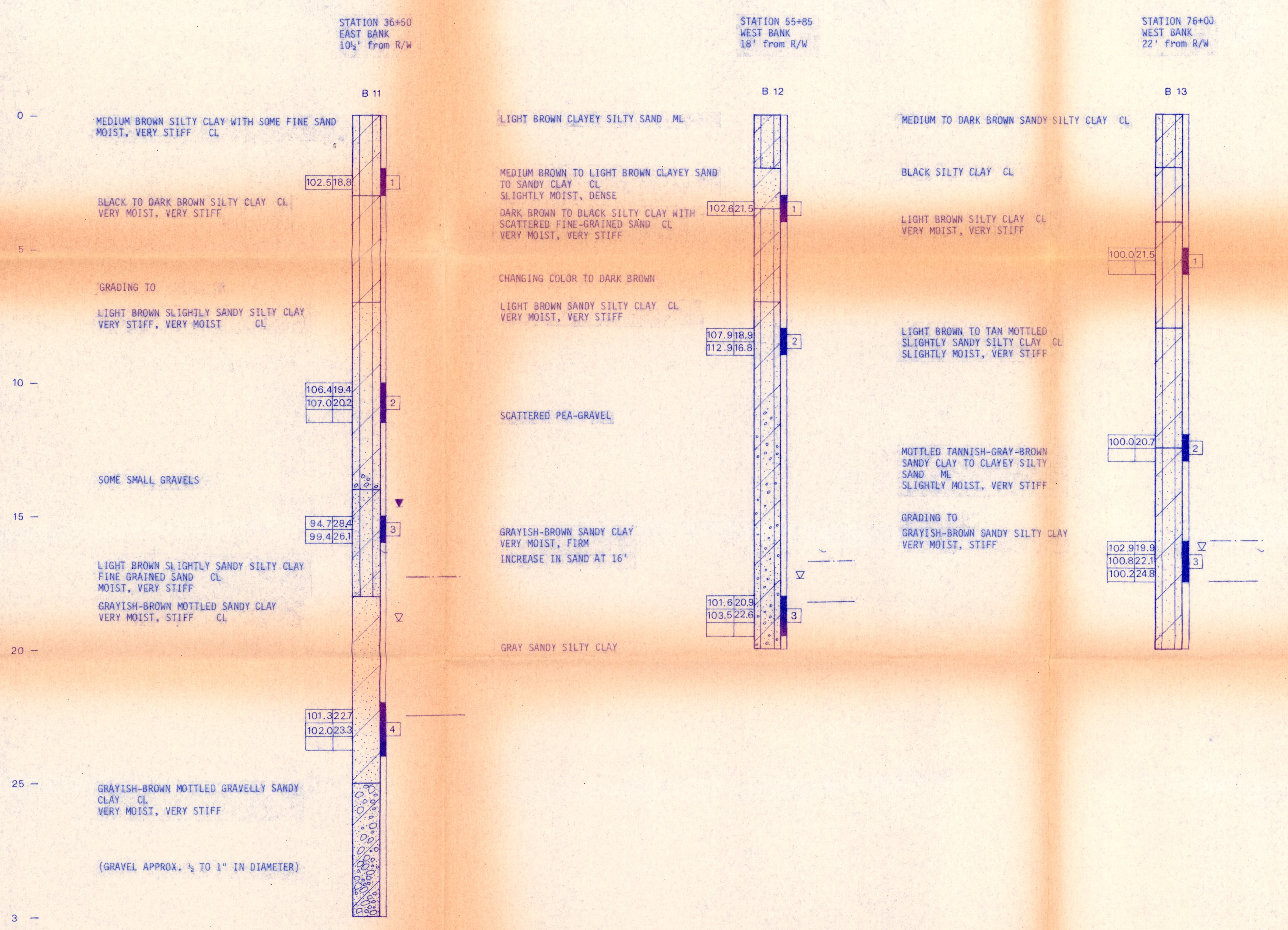


Figure 4

UNITED SOIL ENGINEERING, INC.
Soil, Foundation and Geological Engineers
3476 EDWARD AVE., SANTA CLARA, CA 95050
(408) 988-2990

Date:	9-29-80
Drawn by:	cm
Scale:	1" = 2½'
Job No.:	80-2016-S1

REV.	DESCRIPTION	DATE	APPR.

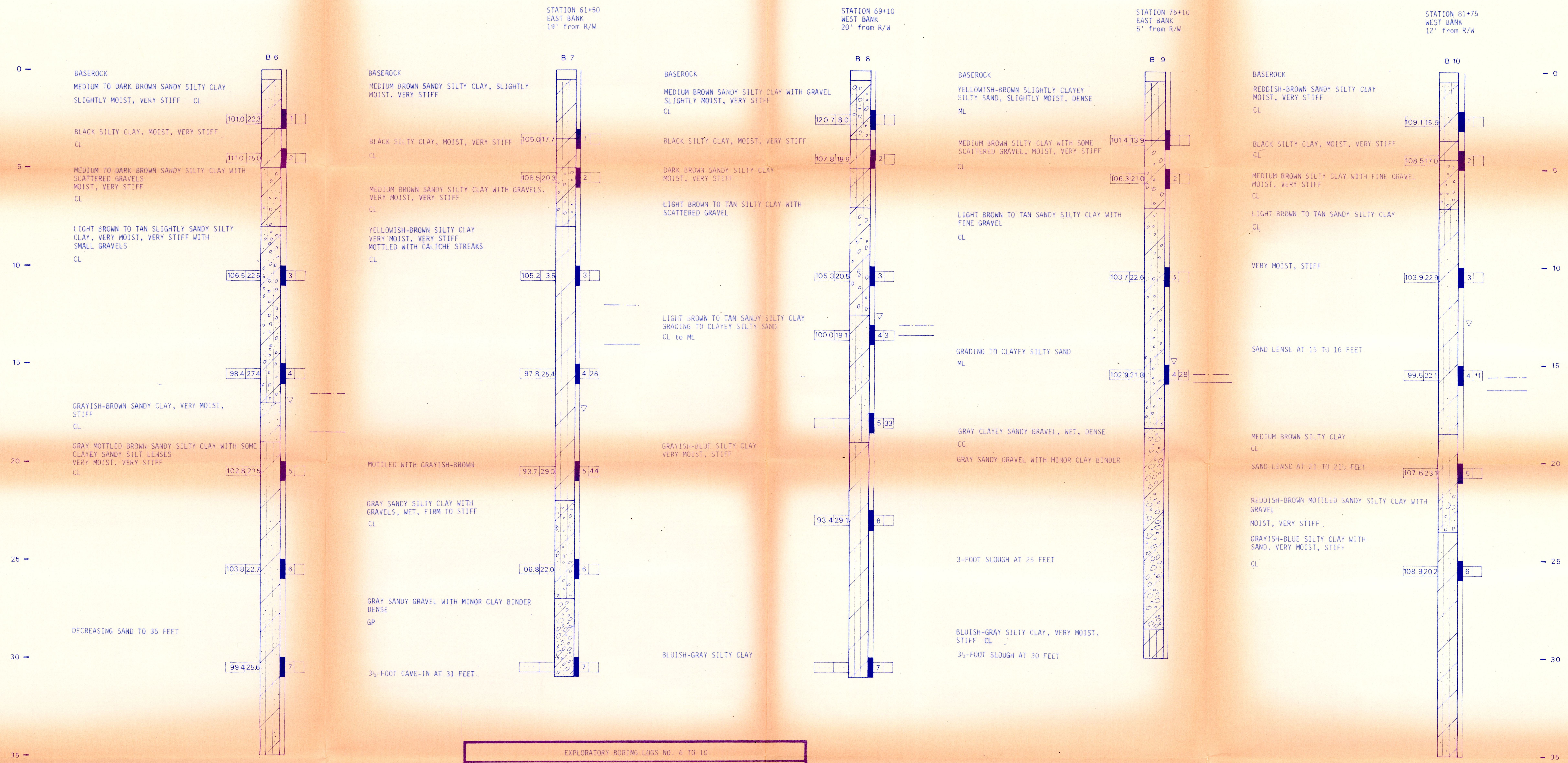
REFERENCE INFORMATION AND NOTES

DATE
DESIGN
DRAWN
CHECKED

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
ENGINEERING APPROVAL

SCALE
SHEET


0
5
10
15
20
25
30
35
B 6
BASEROCK
MEDIUM TO DARK BROWN SANDY SILTY CLAY
SLIGHTLY MOIST, VERY STIFF CL
101.0 22.3 1
BLACK SILTY CLAY, MOIST, VERY STIFF
CL
111.0 15.0 2
MEDIUM TO DARK BROWN SANDY SILTY CLAY WITH SCATTERED GRAVELS
MOIST, VERY STIFF
CL
LIGHT BROWN TO TAN SLIGHTLY SANDY SILTY CLAY, VERY MOIST, VERY STIFF WITH SMALL GRAVELS
CL
106.5 22.5 3
98.4 27.4 4
GRAYISH-BROWN SANDY CLAY, VERY MOIST, STIFF
CL
GRAY MOTTLED BROWN SANDY SILTY CLAY WITH SOME CLAYEY SANDY SILT LENSES
VERY MOIST, VERY STIFF
CL
102.8 23.5 5
103.8 22.7 6
DECREASING SAND TO 35 FEET
99.4 25.6 7
STATION 61+50
EAST BANK
19' from R/W
B 7
BASEROCK
MEDIUM BROWN SANDY SILTY CLAY, SLIGHTLY MOIST, VERY STIFF
BLACK SILTY CLAY, MOIST, VERY STIFF
105.0 17.7 1
CL
108.5 20.3 2
MEDIUM BROWN SANDY SILTY CLAY WITH GRAVELS, VERY MOIST, VERY STIFF
CL
YELLOWISH-BROWN SILTY CLAY
VERY MOIST, VERY STIFF
MOTTLED WITH CALICHE STREAKS
CL
105.2 3.5 3
97.8 25.4 4 26
MOTTLED WITH GRAYISH-BROWN
93.7 29.0 5 44
GRAY SANDY SILTY CLAY WITH GRAVELS, WET, FIRM TO STIFF
CL
06.8 22.0 6
GRAY SANDY GRAVEL WITH MINOR CLAY BINDER
DENSE
GP
--- -- 7
3½-FOOT CAVE-IN AT 31 FEET
STATION 69+10
WEST BANK
20' from R/W
B 8
BASEROCK
MEDIUM BROWN SANDY SILTY CLAY WITH GRAVEL
SLIGHTLY MOIST, VERY STIFF
CL
120.7 8.0
BLACK SILTY CLAY, MOIST, VERY STIFF
107.8 18.6 2
DARK BROWN SANDY SILTY CLAY
MOIST, VERY STIFF
LIGHT BROWN TO TAN SILTY CLAY WITH SCATTERED GRAVEL
105.3 20.5 3
LIGHT BROWN TO TAN SANDY SILTY CLAY
GRADING TO CLAYEY SILTY SAND
CL to ML
100.0 19.1 4 3
5 33
GRAYISH-BLUE SILTY CLAY
VERY MOIST, STIFF
93.4 29.1 6
BLUISH-GRAY SILTY CLAY
--- - 7
STATION 76+10
EAST BANK
6' from R/W
B 9
BASEROCK
YELLOWISH-BROWN SLIGHTLY CLAYEY
SILTY SAND, SLIGHTLY MOIST, DENSE
ML
101.4 13.9
MEDIUM BROWN SILTY CLAY WITH SOME SCATTERED GRAVEL, MOIST, VERY STIFF
CL
106.3 21.0 2
LIGHT BROWN TO TAN SANDY SILTY CLAY WITH FINE GRAVEL
CL
103.7 22.6 3
GRADING TO CLAYEY SILTY SAND
ML
102.9 21.8 4 28
GRAY CLAYEY SANDY GRAVEL, WET, DENSE
CC
GRAY SANDY GRAVEL WITH MINOR CLAY BINDER
3-FOOT SLOUGH AT 25 FEET
BLUISH-GRAY SILTY CLAY, VERY MOIST, STIFF CL
3½-FOOT SLOUGH AT 30 FEET
STATION 81+75
WEST BANK
12' from R/W
B 10
BASEROCK
REDDISH-BROWN SANDY SILTY CLAY
MOIST, VERY STIFF
CL
109.1 15.9 1
BLACK SILTY CLAY, MOIST, VERY STIFF
CL
108.5 17.0 2
MEDIUM BROWN SILTY CLAY WITH FINE GRAVEL
MOIST, VERY STIFF
CL
LIGHT BROWN TO TAN SANDY SILTY CLAY
CL
VERY MOIST, STIFF
103.9 22.9 3
SAND LENSE AT 15 TO 16 FEET
99.5 22.1 4 11
MEDIUM BROWN SILTY CLAY
CL
SAND LENSE AT 21 TO 21½ FEET
107.6 23.1 5
REDDISH-BROWN MOTTLED SANDY SILTY CLAY WITH GRAVEL
MOIST, VERY STIFF
GRAYISH-BLUE SILTY CLAY WITH SAND, VERY MOIST, STIFF
CL
108.9 20.2 6
0
5
10
15
20
25
30
35

EXPLORATORY BORING LOGS NO. 6 TO 10

SAN TOMAS AQUINO CREEK IMPROVEMENTS

SANTA CLARA, CALIFORNIA

Figure 3

UNITED SOIL ENGINEERING, INC.
Soil, Foundation and Geological Engineers
3476 EDWARD AVE., SANTA CLARA, CA 95050
(408) 988-2990

Date:	9-12-80
Drawn by:	cm
Scale:	1" = 2½'
Job No.:	80-2016-S1

REV.	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES

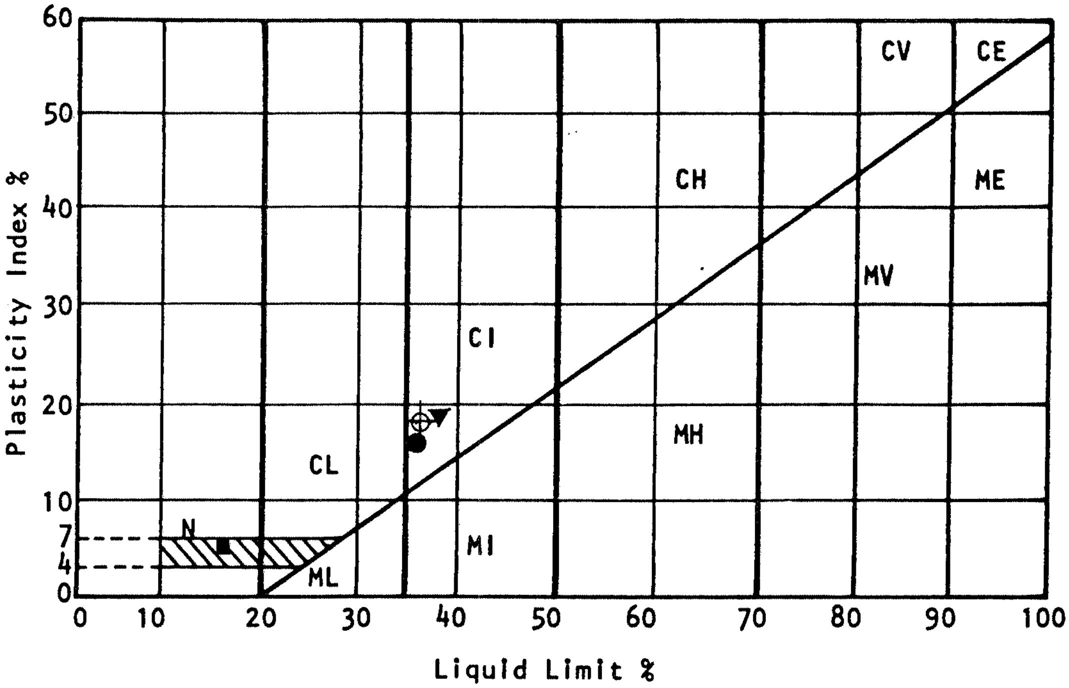
DATE
DESIGN
DRAWN
CHECKED

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
ENGINEERING APPROVAL

SCALE
SHEET

PLASTICITY CHART



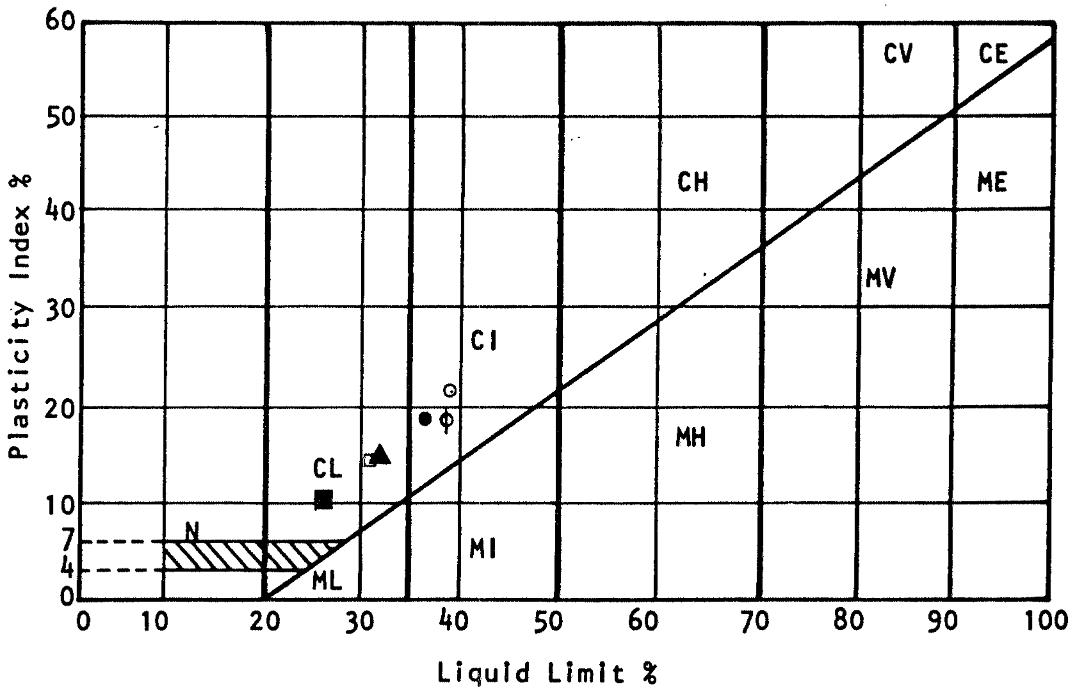
PLASTICITY DATA

Key Symbol	Hole No.	Depth Ft.	Liquid Limit %	Plasticity Index %	Unified Soil Classification Symbol*
●	3-3	10	36	17	CI
▼	5-2	4	37.5	18.5	CI
■	8-1	2	16	6.5	N.P.
⌖	11-2 A	10½	36	17.6	CI

* Soil type classification based on British suggested revisions to Unified Soils Classification System

Figure 5 - Plasticity Index

PLASTICITY CHART



PLASTICITY DATA

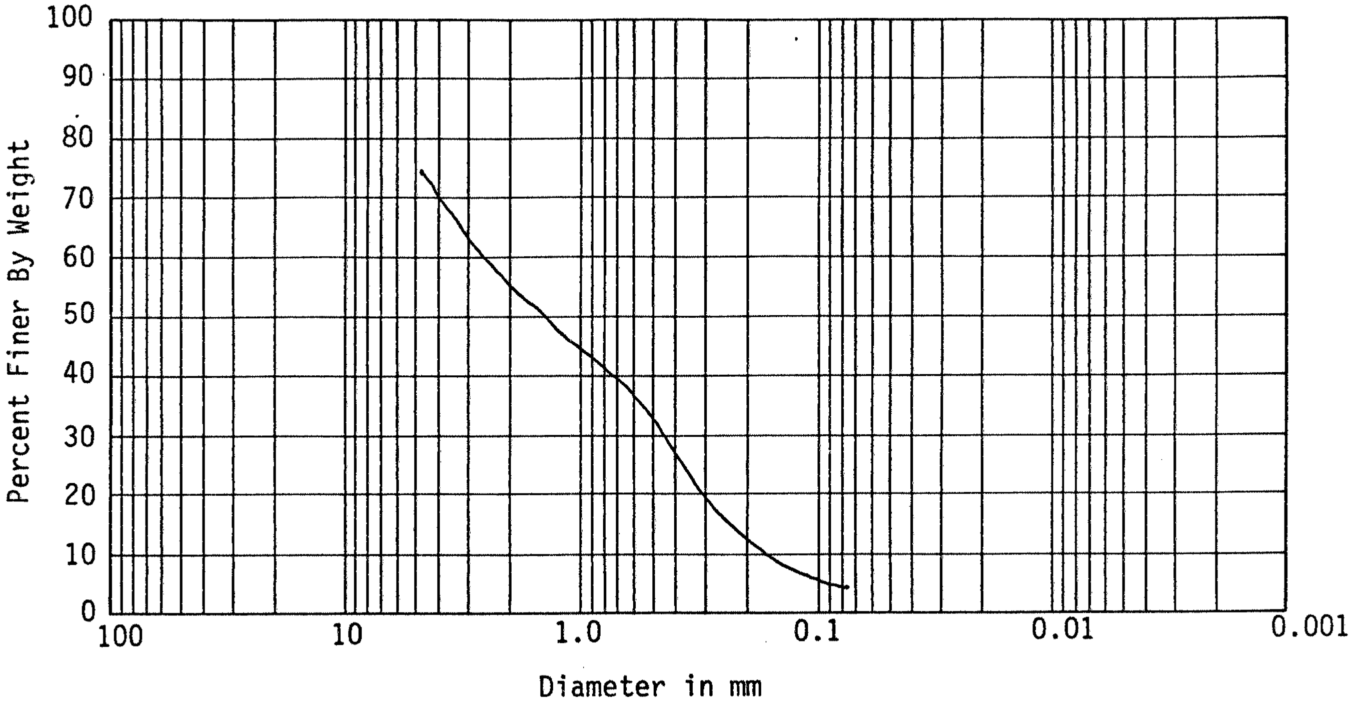
Key Symbol	Hole No.	Depth Ft.	Liquid Limit %	Plasticity Index %	Unified Soil Classification Symbol*
●	11-3B	15½	36.1	18.2	CI
⊙	12-2A	8	39.0	21.4	CI
■	12-3B	18½	27.0	10.0	CL
ϕ	13-1A	5	38.0	19.0	CI
⊖	13-2B	13	35.0	17.5	CI
□	13-3C	17	31.0	14.5	CL
▲	BAG A	2	31.8	14.6	CL

* Soil type classification based on British suggested revisions to Unified Soils Classification System

Figure 6 - Plasticity Index

GRAIN SIZE ANALYSIS

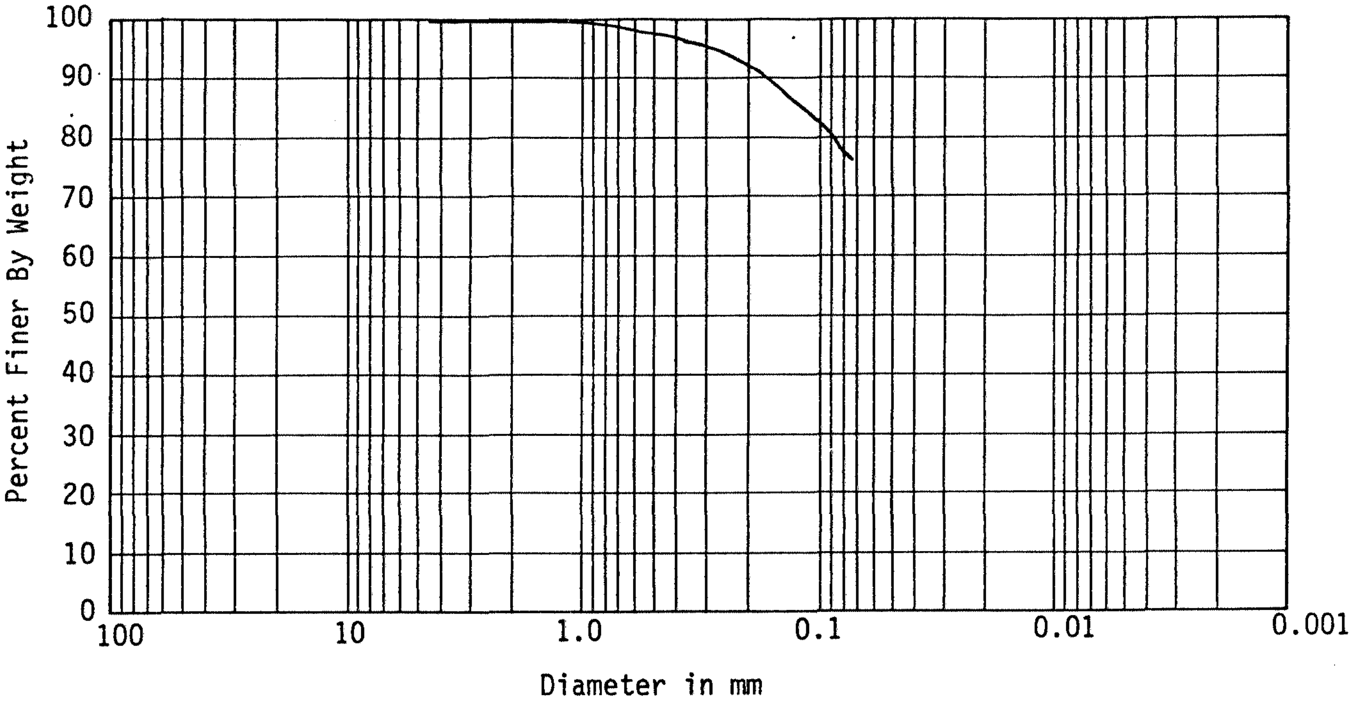
SAMPLE 5-3



Sieve No.	(mm)	Percent Finer
4	4.75	74.2
10	2.00	55.3
20	0.84	40.4
50	0.30	18.7
100	0.15	7.7
200	0.074	4.1

Figure 7 - Gradation Curve

GRAIN SIZE ANALYSIS

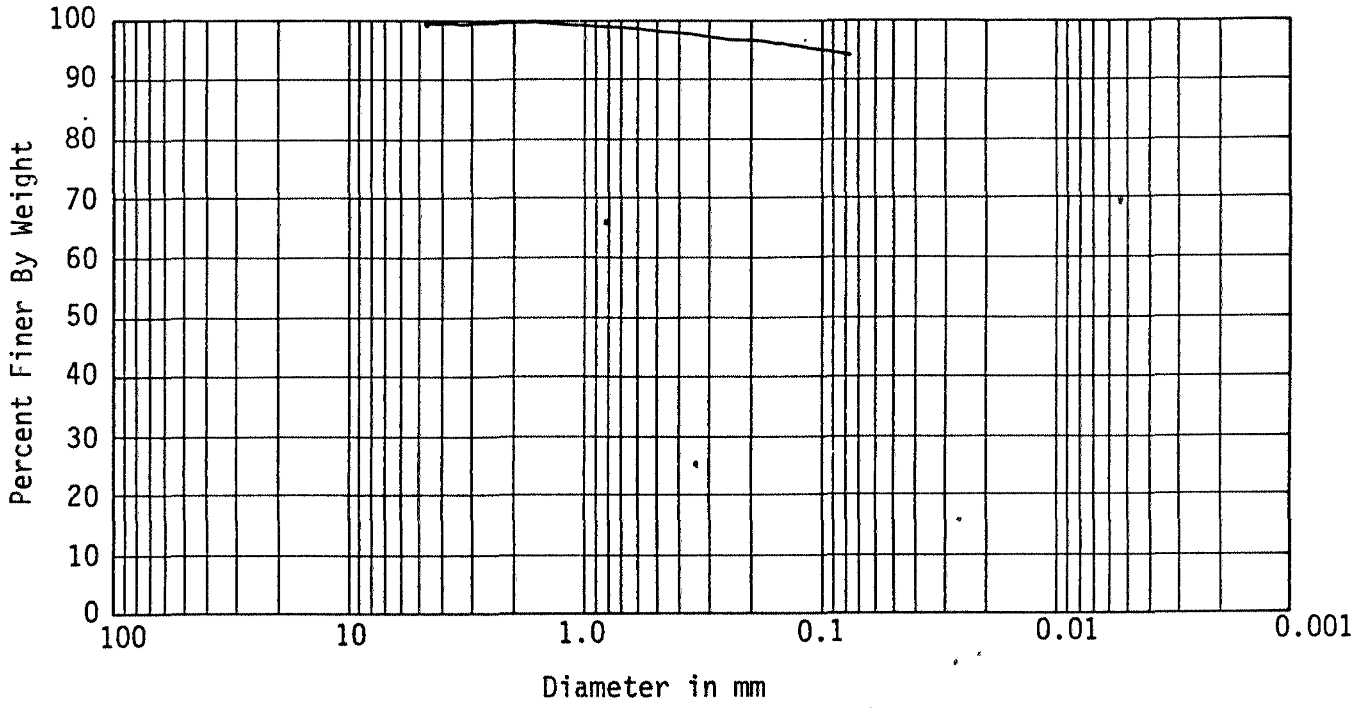


Sample 11-2B

Sieve No.	(mm)	Percent Finer
4	4.75	99.5
10	2.0	99.3
20	.85	98.2
50	.30	95.2
100	.15	87.1
200	.075	76.5

Figure 8 - Gradation Curve

GRAIN SIZE ANALYSIS

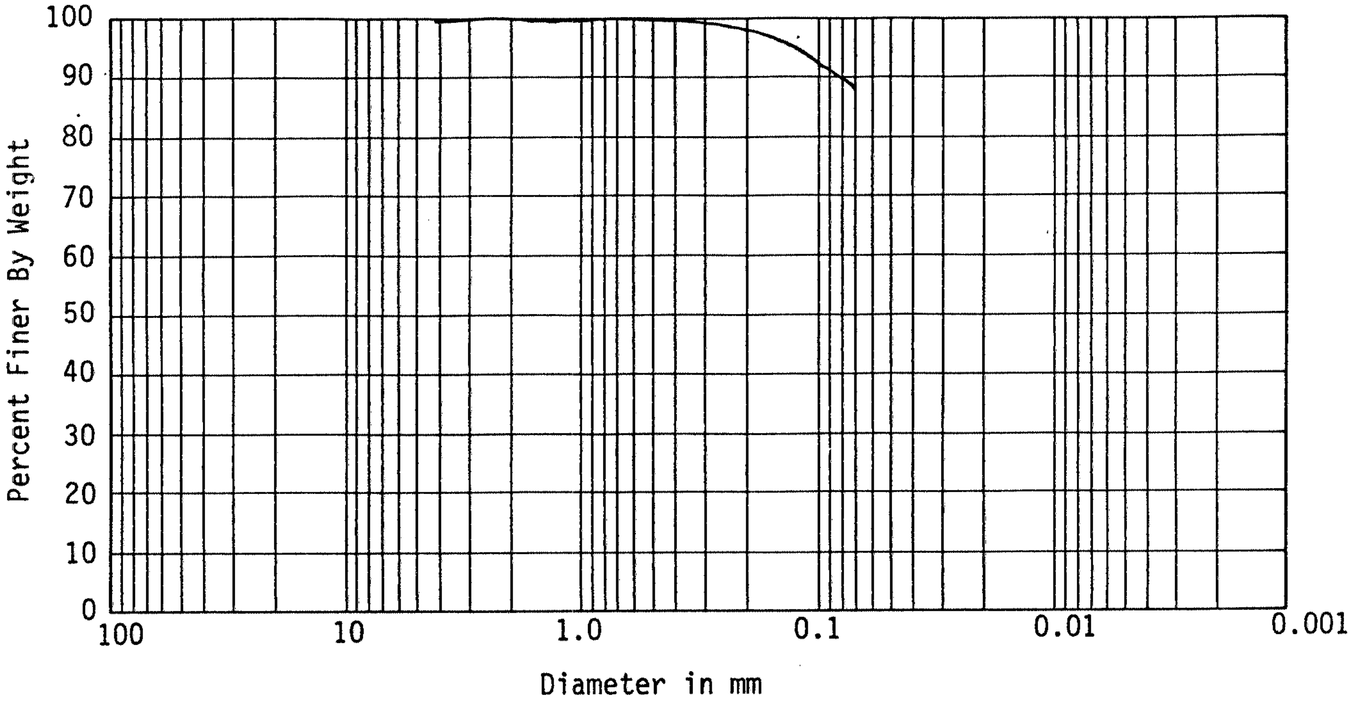


Sample 11-3A

Sieve No.	(mm)	Percent Finer
4	4.75	99.9
10	2.0	98.6
20	.85	98.0
50	.30	97.2
100	.15	96.4
200	.075	94.1

Figure 9 - Gradation Curve

GRAIN SIZE ANALYSIS

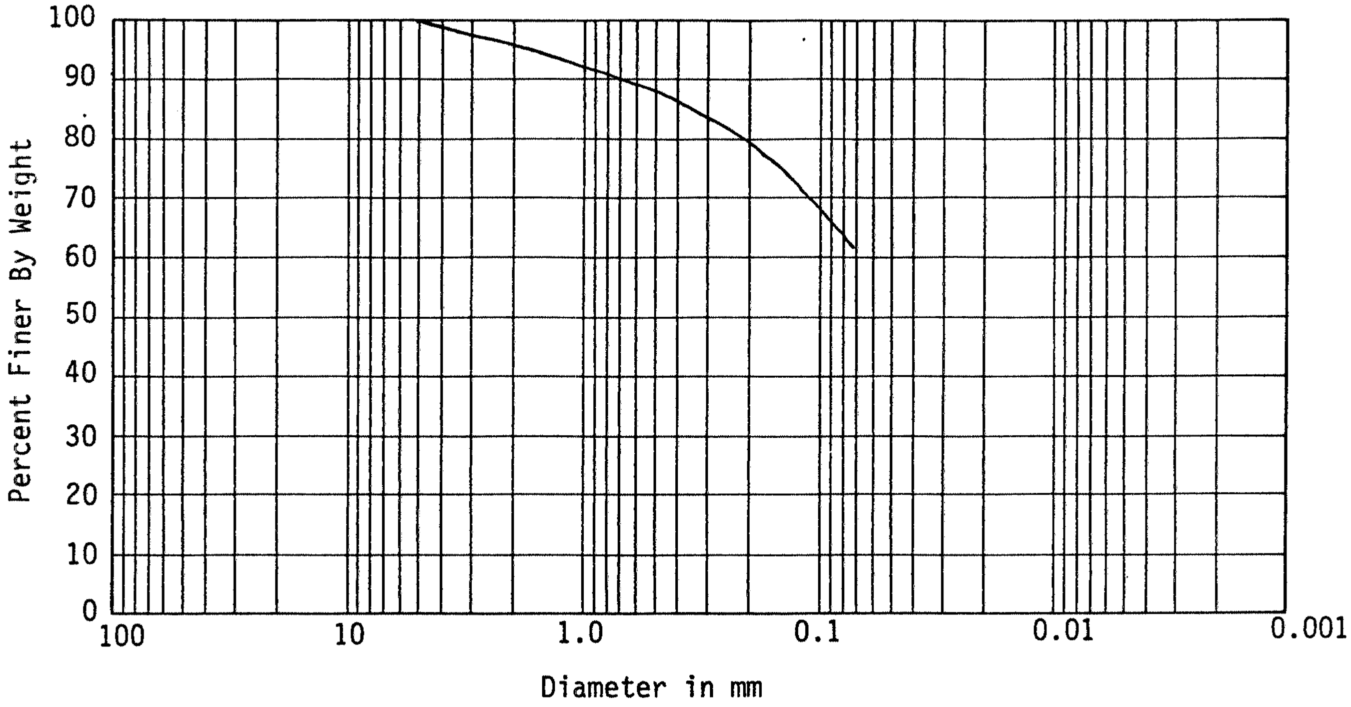


Sample 11-4B

Sieve No.	(mm)	Percent Finer
4	4.75	100.0
10	2.0	99.0
20	.85	99.6
50	.30	98.9
100	.15	95.3
200	.075	88.3

Figure 10 - Gradation Curve

GRAIN SIZE ANALYSIS

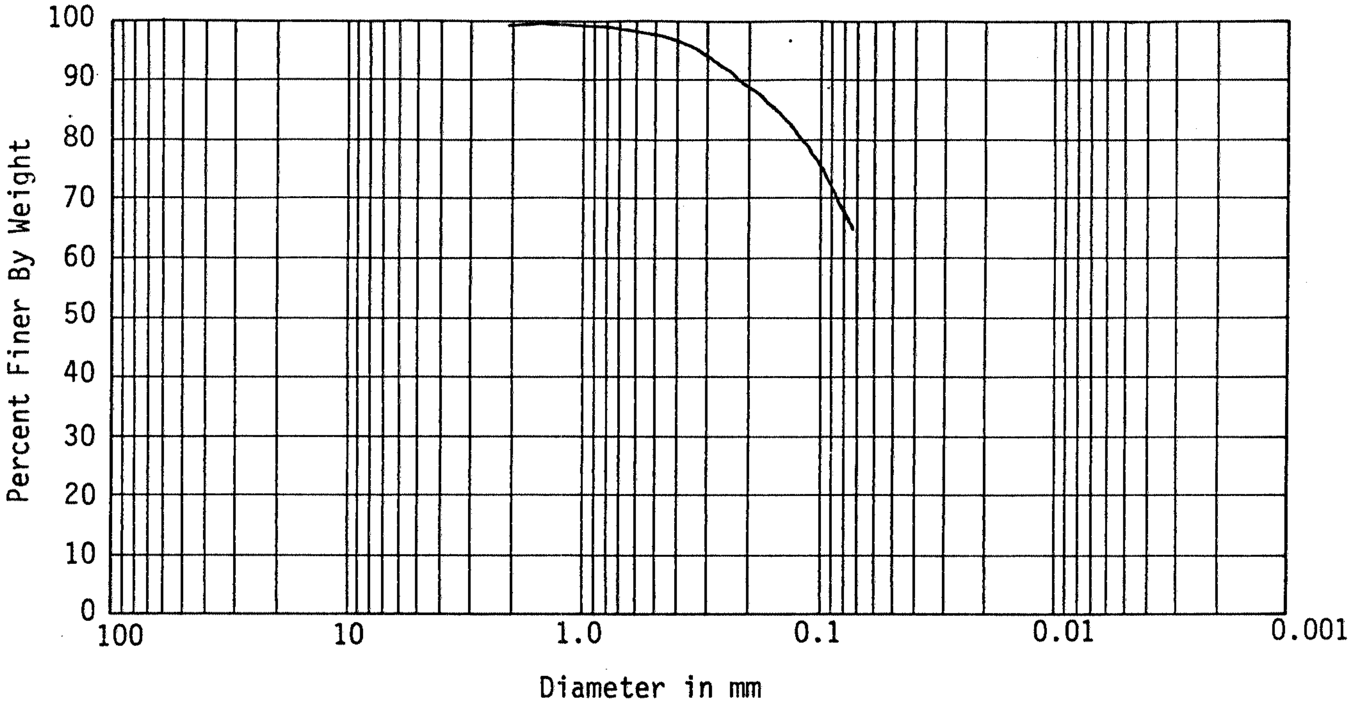


Sample 12-2B

Sieve No.	(mm)	Percent Finer
4	4.75	99.7
10	2.0	95.8
20	.85	91.4
50	.30	84.0
100	.15	73.1
200	.075	63.3

Figure 11 - Gradation Curve

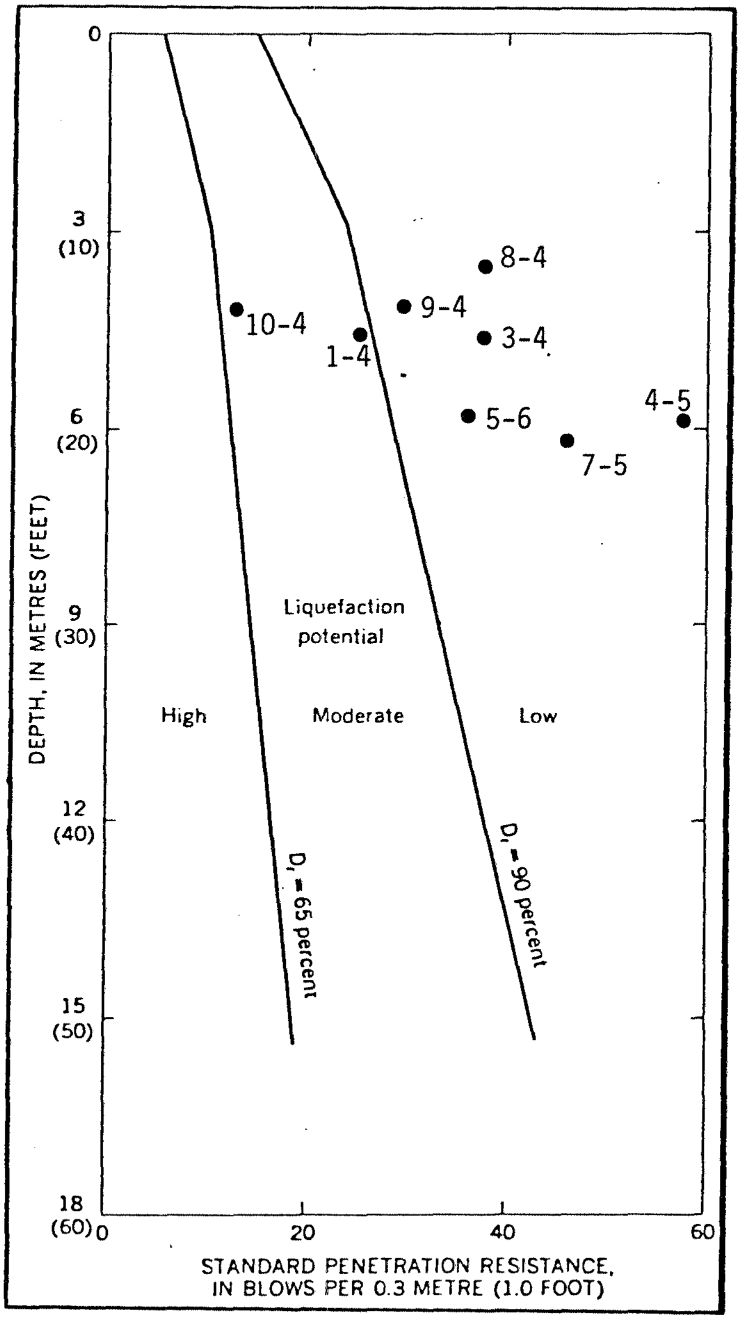
GRAIN SIZE ANALYSIS



Sample 12-3B

Sieve No.	(mm)	Percent Finer
4	4.75	100.0
10	2.0	99.9
20	.85	99.2
50	.30	96.6
100	.15	83.0
200	.075	65.7

Figure 12 - Gradation Curve



● = Data points from borings. Numbers indicate boring and sample location.

Liquefaction potential of potentially liquefiable granular sedimentary material in boreholes at the project site, based on standard penetration resistance in blows per foot (.3 m.). (Adapted from Youd, T.L., Nichols, D.R., Helley, E.J., and Lajoie, K.R., 1975, Liquefaction potential, *in* Borcherdt, R.D., ed., Studies for seismic zonation of the San Francisco Bay Region: U.S. Geol. Surv. Prof. Paper 941-A, p. A71, Fig. 49.)
Diagram based on depth to the water table = 10 ft. (3 m.).

Figure 13 - Liquefaction Potential Graph

TABLE I

SUMMARY OF MOISTURE, DENSITY, UNCONFINED COMPRESSION AND DIRECT SHEAR TESTING

Sample No.	Depth Ft.	In-Place Conditions		Unconfined Compressive Strength k.s.f. (Failure Angle)	Direct Shear Testing		Specific Gravity
		Moisture Content % Dry Wt.	Dry Density p.c.f.		Angle of Internal Friction Degrees	Unit Cohesion p.s.f.	
1-1	2	19.1	96.8		22	.76	
1-2	5	30.8	90.7				
1-3	10	31.2	91.6				2.65
1-4	15	24.5	101.6				
1-5	20	21.5	105.8				
1-6	25	27.2	90.8				
1-7	30	NO RECOVERY					
2-1	2	23.1	87.6				
2-2	5	DISTURBED					
2-3	10	27.5	97.3				
2-4	15	24.8	102.1				
2-5	20	23.8	103.3				
2-6	25	22.7	105.4				2.68
2-7	30	23.5	104.7				
3-1	2	11.8	96.9				
3-2	4	16.9	104.9	.947 (vert)			
3-3	10	22.4	104.1				
3-4	15	DISTURBED					
3-5	20	22.3	104.9				
3-6	25	26.8	102.1				
3-7	30	19.2	114.6				2.71
4-1	3	28.0	94.6				2.66
4-2	5	24.9	97.8	7.342 (73°)			
4-3	10	18.2	114.1				
4-4	15	25.2	99.7				
4-5	18	NO RECOVERY					
4-6	25	NO RECOVERY					
4-7							
5-1	2	24.4	97.7		21.3	.70	
5-2	4	21.4	102.9				
5-3	10	3.8	117.3				2.70
5-4	15	11.3	121.5				
5-5	18	16.1	114.5				
5-6	25	20.3	107.8				
5-7	30	21.1	107.3				

TABLE I

SUMMARY OF MOISTURE, DENSITY, UNCONFINED COMPRESSION AND DIRECT SHEAR TESTING

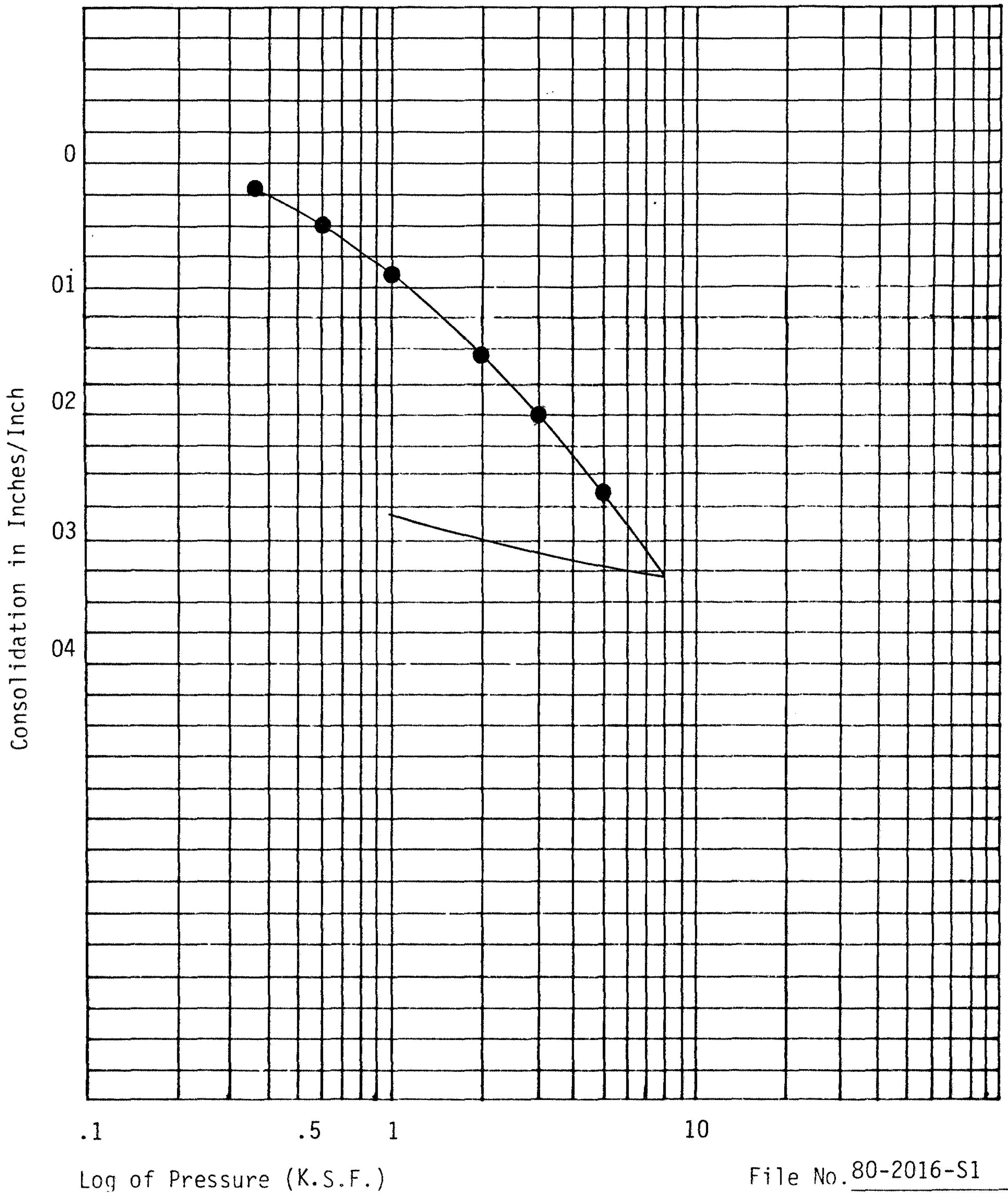
Sample No.	Depth Ft.	In-Place Conditions		Unconfined Compressive Strength k.s.f. (Failure Angle)	Direct Shear Testing		Specific Gravity
		Moisture Content % Dry Wt.	Dry Density p.c.f.		Angle of Internal Friction Degrees	Unit Cohesion p.s.f.	
6-1	2	22.3	101.0	7.407 (51°)			
6-2	4	15.0	110.0				
6-3	10	22.5	106.5				
6-4	15	27.4	98.4				
6-5	20	23.5	102.8				
6-6	25	22.7	103.8				2.68
6-7	30	25.6	99.4				
7-1	3	17.7	105.0				
7-2	5	20.3	108.5	6.6 (55°)			
7-3	10	23.5	105.4				
7-4	15	25.4	97.8				
7-5	20	29.0	93.7				
7-6	25	22.0	106.8				
7-7	30	NO RECOVERY					
8-1	2	8.0	120.7				2.72
8-2	4	18.6	107.8				
8-3	10	20.5	105.3				
8-4	13	19.1	100.0				
8-5	20	NO RECOVERY					
8-6	25	29.1	93.4				
8-7	30	NO RECOVERY					
9-1	3	13.9	101.4				
9-2	5	21.0	106.3				
9-3	10	22.6	103.7				
9-4	15	21.8	102.9	.937 (vert)			
10-1	2	15.9	109.1				
10-2	4	17.0	108.5				
10-3	10	22.9	103.9				
10-4	15	22.1	99.5				
10-5	20	23.1	107.6				
10-6	25	20.2	108.9				

TABLE I

SUMMARY OF MOISTURE, DENSITY, UNCONFINED COMPRESSION AND DIRECT SHEAR TESTING

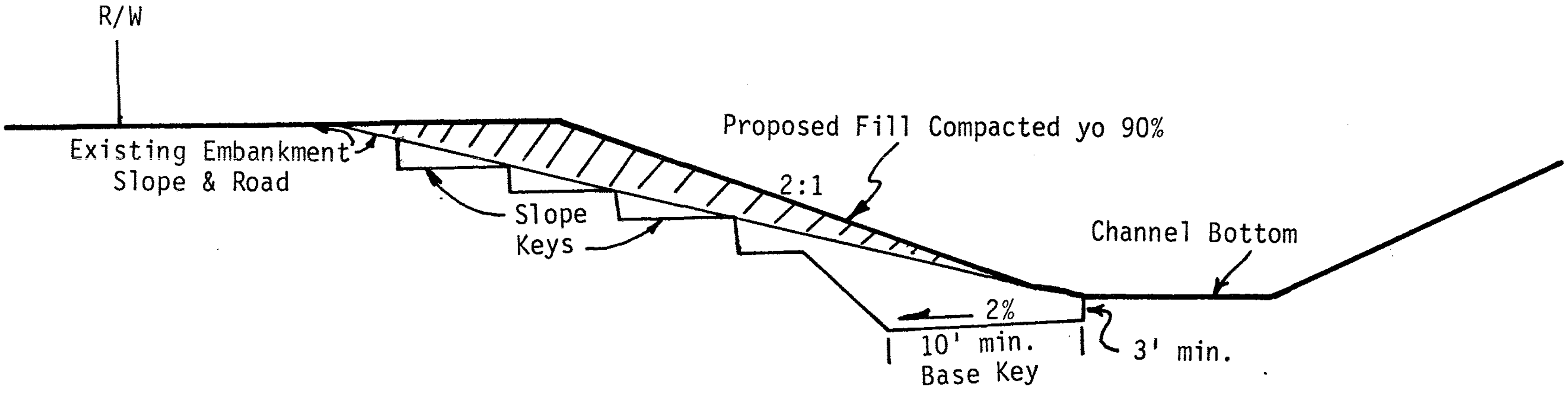
Sample No.	Depth Ft.	In-Place Conditions		Unconfined Compressive Strength k.s.f. (Failure Angle)	Direct Shear Testing	
		Moisture Content % Dry Wt.	Dry Density p.c.f.		Angle of Internal Friction Degrees	Unit Cohesion p.s.f.
11-1	3	18.8	102.5			
11-2A	10½	19.4	106.4			
11-2B	11	20.2	107.0			
11-3A	15	28.4	94.7			
11-3B	15½	26.1	99.4			
11-4A	22	22.7	101.3	.97 (vert)		
11-4B	22½	23.3	102.0			
12-1	3	21.5	102.6			
12-2A	8	18.9	107.9			
12-2B	8½	16.8	112.9			
12-3B	18½	20.9	101.6			
12-3C	19	22.6	103.5	1.7 (vert)		
13-1A	5	21.5	100.0			
13-2B	13	20.7	100.0			
13-3A	16	19.9	102.9	.95 (vert)		
13-3B	16½	22.1	100.8			
13-3C	17	24.8	100.2			

CONSOLIDATION ANALYSIS



File No. 80-2016-S1
Sample No. 13-3B
Date: 10-15-80
By: V.V.

Figure 14 - Consolidation Curve

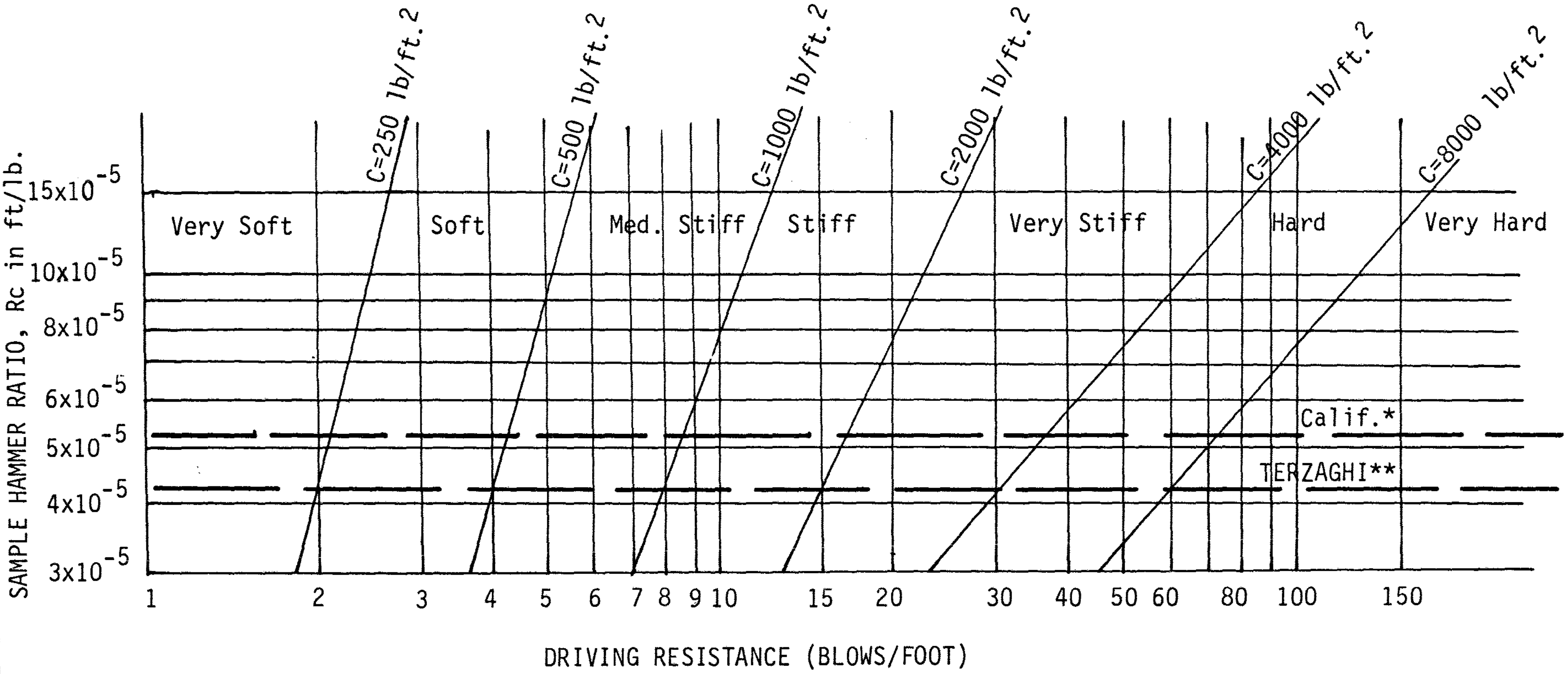


SCHEMATIC CROSS - SECTION

KEYED & BENCHED FILL SLOPE CONSTRUCTION

Figure 15 - Slope Reconstruction Diagram

TABLE II - Blow Count Relationship Chart



*(2.5" O.D. - 1.9" I.D.)

**(2" O.D. - 1.375" I.D.)

Relationship between blow counts from
California Modified Sampler & Terzaghi Sampler

(From: THEORY by Dr. Lamb & PRACTICAL STUDY by Dames & Moore)

SLOPE STABILITY ANALYSIS

Figure 16

FILE No. 80- 2016 - S2
OCTOBER 28, 1980

SUBJECT : SAN TOMAS AQUINO CREEK IMPROVEMENT
SLOPE STABILITY ANALYSIS
FOR EMBANKMENT AT STA. 28+00
SLOPE 1.5 : 1

OBJECT : TO INVESTIGATE THE STABILTY OF THE EMBANKMENT AT STATION 28+00.
TO COMPUTE THE FACTOR OF SAFETY AGAINST SLIDING

METHOD OF COMPUTATION : SLICE METHOD
BY : VIEN VO , P.E.
LABORATORY DATA : DRY DENSITY = 97 P.C.F
ANGLE OF INTERNAL FRICTION = 17°
COHESION = 380 P.S.F.

EXPLANATIONS FOR COMPUTATION SHEET

COL 1	SLICE
COL 2	WIDTH OF SLICE SCALE 1" = 10' FOR HORIZONTAL & VERTICAL SCALE
COL 3	WEIGHT OF SLICE = AREA OF SLICE x UNIT WEIGHT OF SOIL
COL 4	ANGLE FROM VERTICAL LINE TO LINE DRAWN FROM CENTER OF CIRCLE OF FAILURE TO THE ARC CENTER OF SLICE
COL 5	ΔT , TANGENTIAL DRIVING FORCE $= \Delta W . \sin(\alpha)$
COL 6	$\Delta \bar{l} = \dfrac{\Delta x}{\cos(\alpha)}$ APPROXIMATE ARC LENGTH $C\Delta \bar{l}$ = COHESION RESISTING FORCE
COL 7	$\Delta N = \Delta W . \cos(\alpha)$ FRICTION RESISTING FORCE

$$\text{FACTOR OF SAFETY AGAINST SLIDING} = \frac{\Sigma \Delta N + \Sigma C \Delta \bar{l}}{\Delta T}$$

REFERENCE : RALPH B. PECK , WALTER E. HANSON, AND
THOMAS H. THORNBURN , FOUNDATION ENGINEERING, 2ND EDITION.,
NEWYORK , WILEY, 357 -356 PP.

DRY DENSITY $\gamma_D = 97$ P.C.F

FIELD MOISTURE $w = 15\%$

$\Rightarrow$ FIELD WET DENSITY $\Rightarrow$ $\gamma_w = 1.15(97) = 111.55$ P.C.F.

CORRECTION ~~FR~~ WET DENSITY

$\Sigma\Delta T$, AND $\Sigma\Delta N$ COLUMN WILL BE MULTIPLIED BY A FACTOR OF 1.15

CORRECTION FOR MINIMUM SAFETY FACTOR AGAINST SLIDING FOR WET DENS

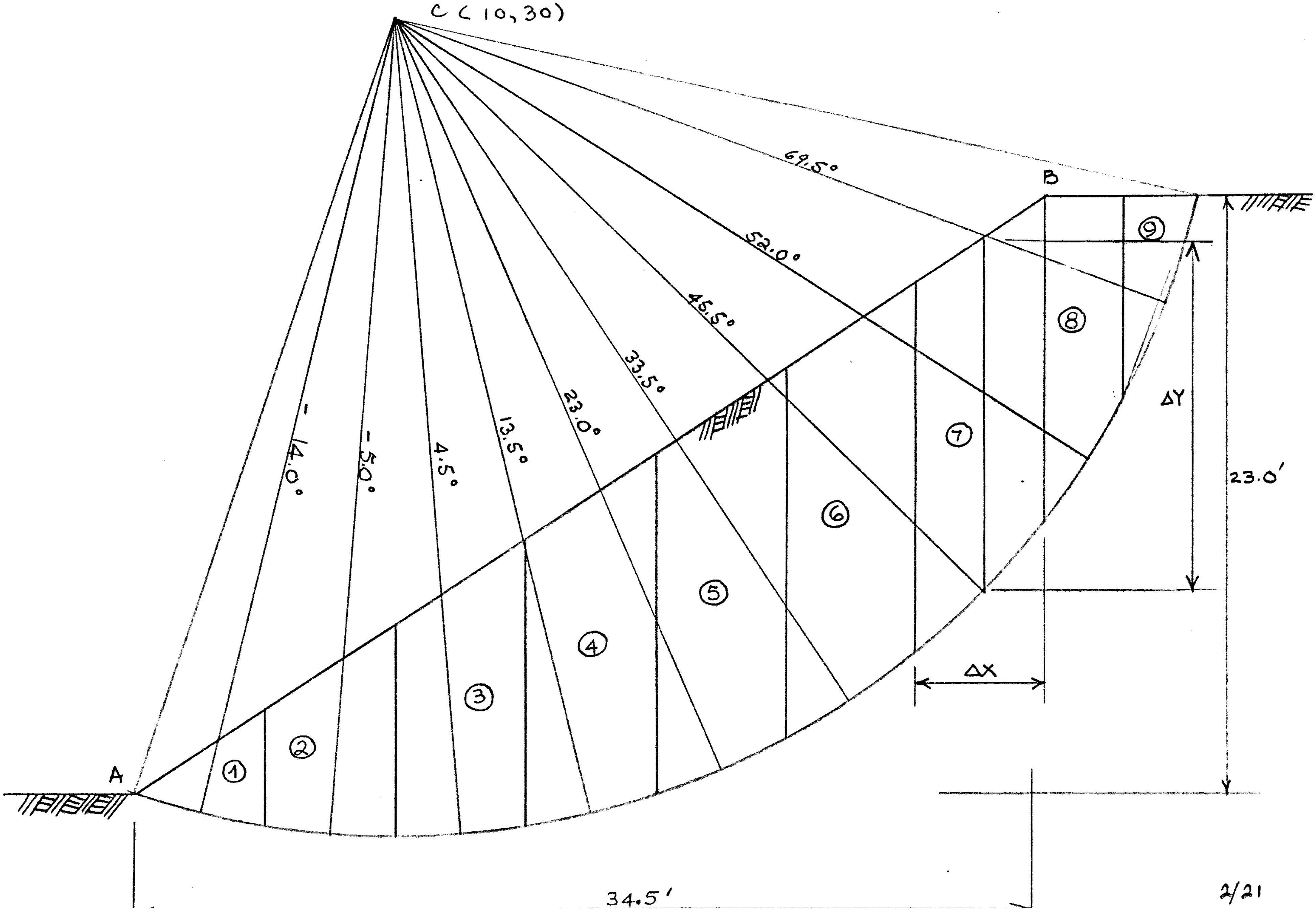
$$S.F._{(MIN)} = \frac{13{,}096 \times 1.15 + 21{,}580}{18{,}820 \times 1.15} = \frac{15{,}060 + 21{,}580}{21{,}643} = 1.69$$

$$S.F._{(MIN)} = 1.69 > 1$$

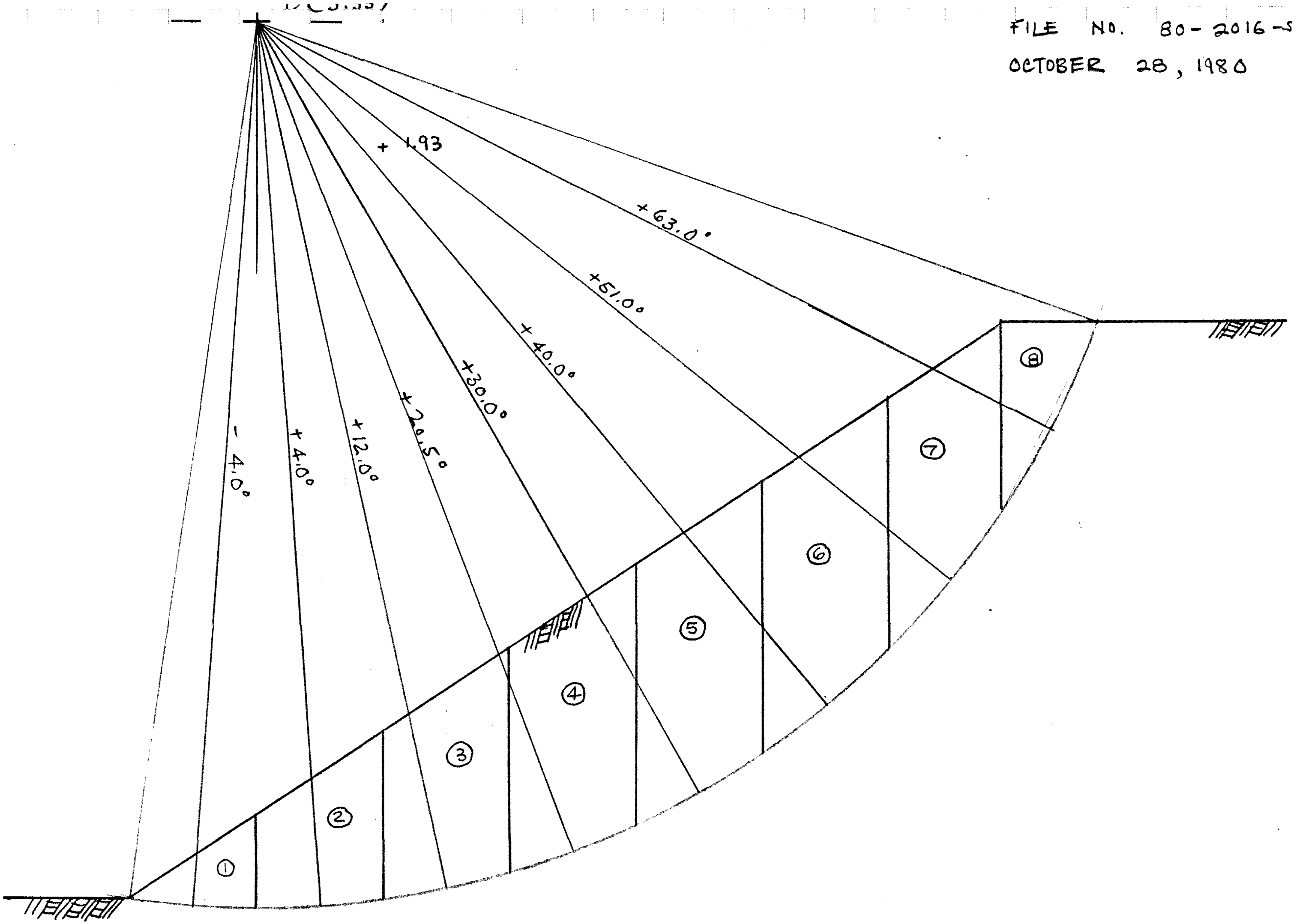
CONCLUSION THE MOST CRITICAL SLOPE AT STATION 28+00, 1.5:1 IS STABLE SINCE $S.F._{MIN} = 1.69 > 1$

FILE No 80-2010-S2

OCTOBER 28, 1980

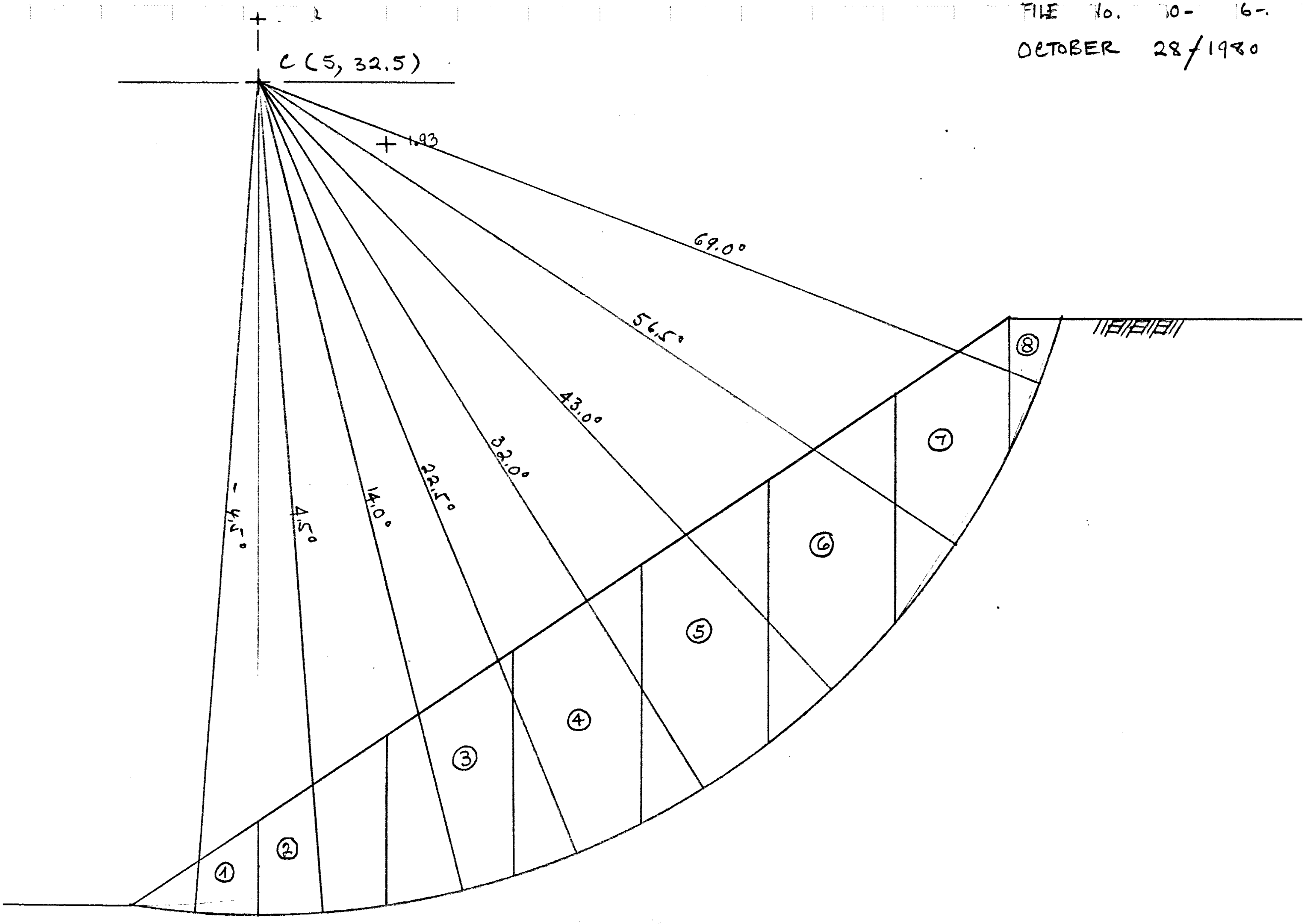


FILE NO. 80-2016-S
OCTOBER 28, 1980



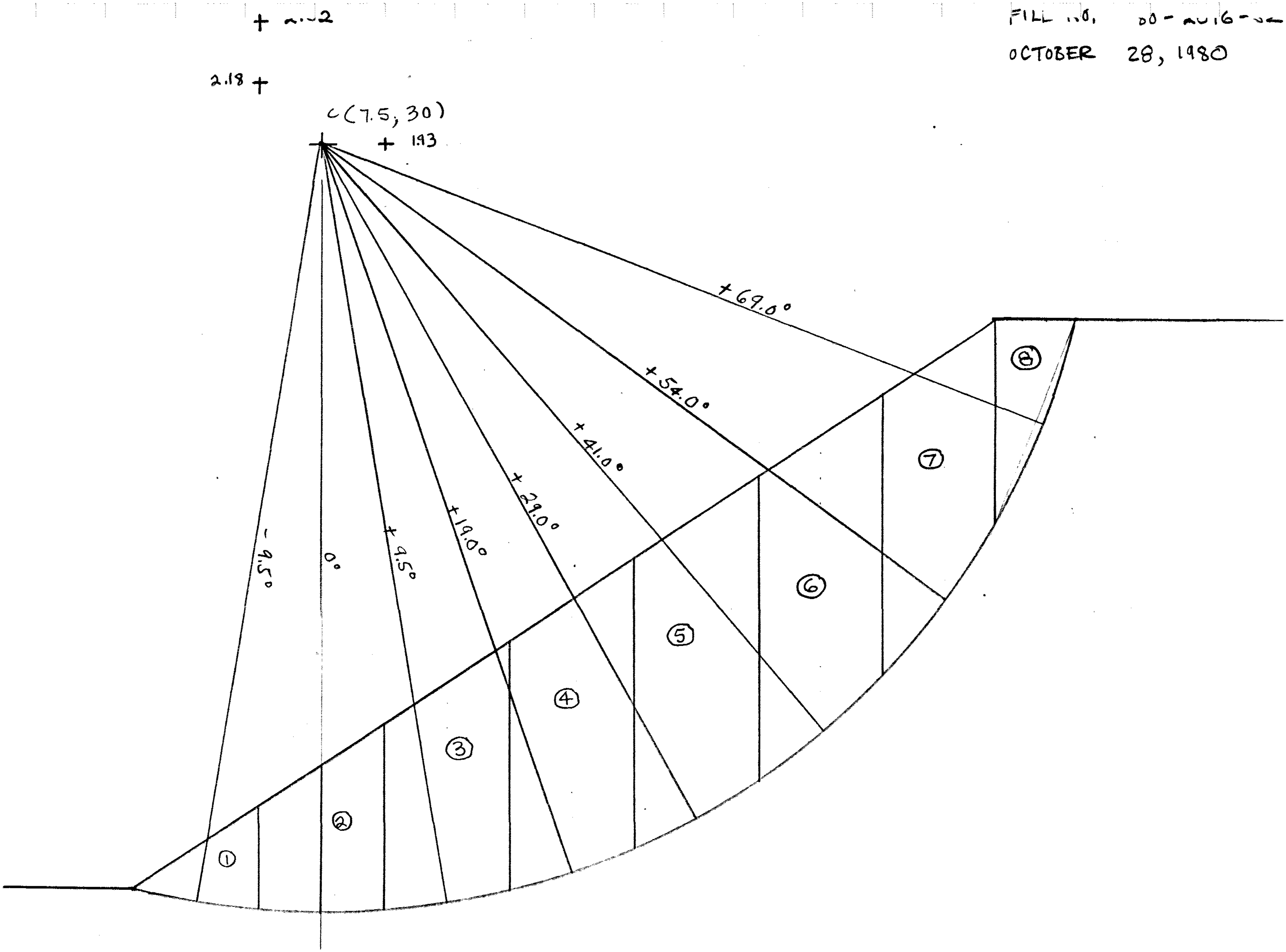
FILE No. 0- 16-

OCTOBER 28/1980

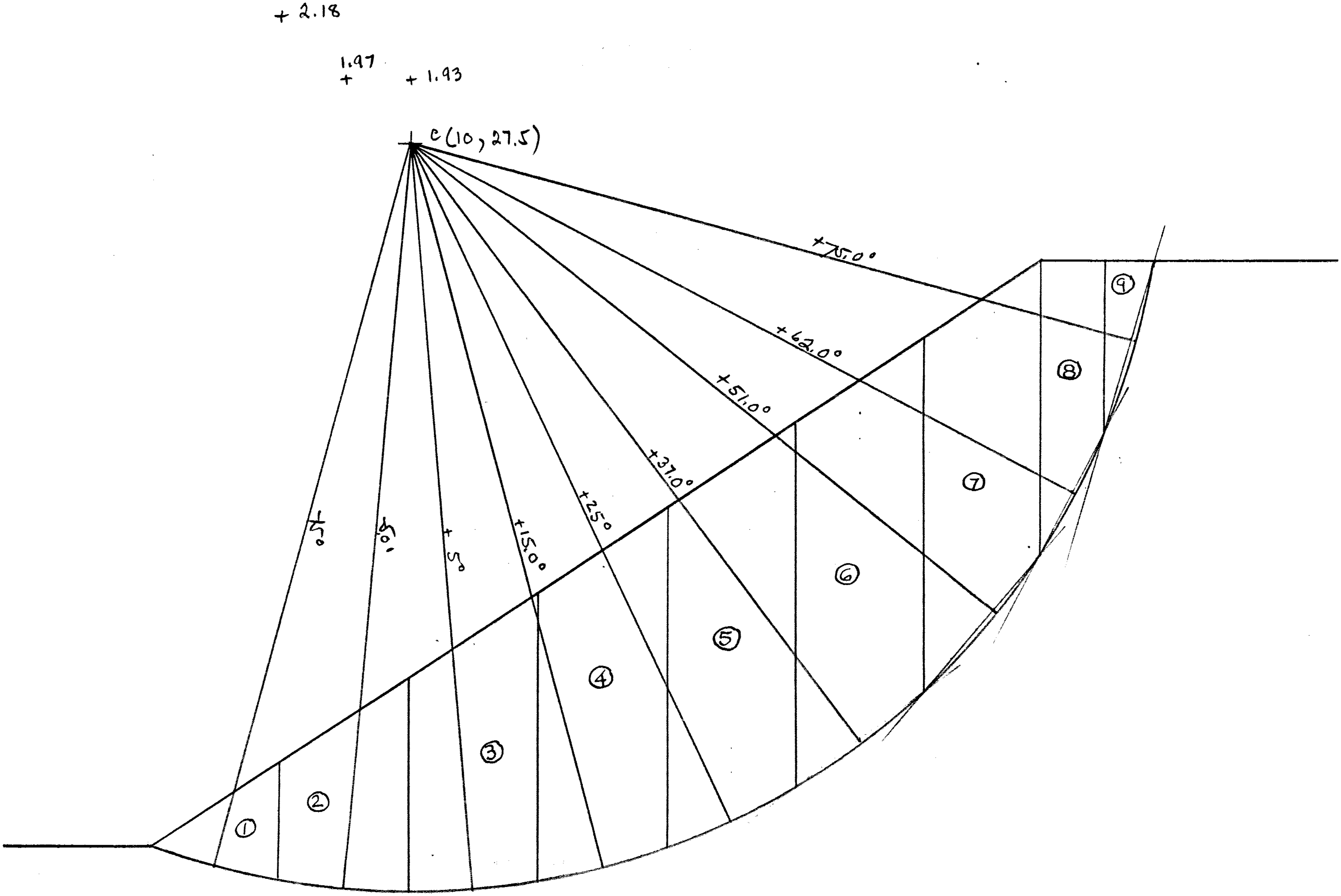


FILE NO. 00-AU16-[illegible]

OCTOBER 28, 1980

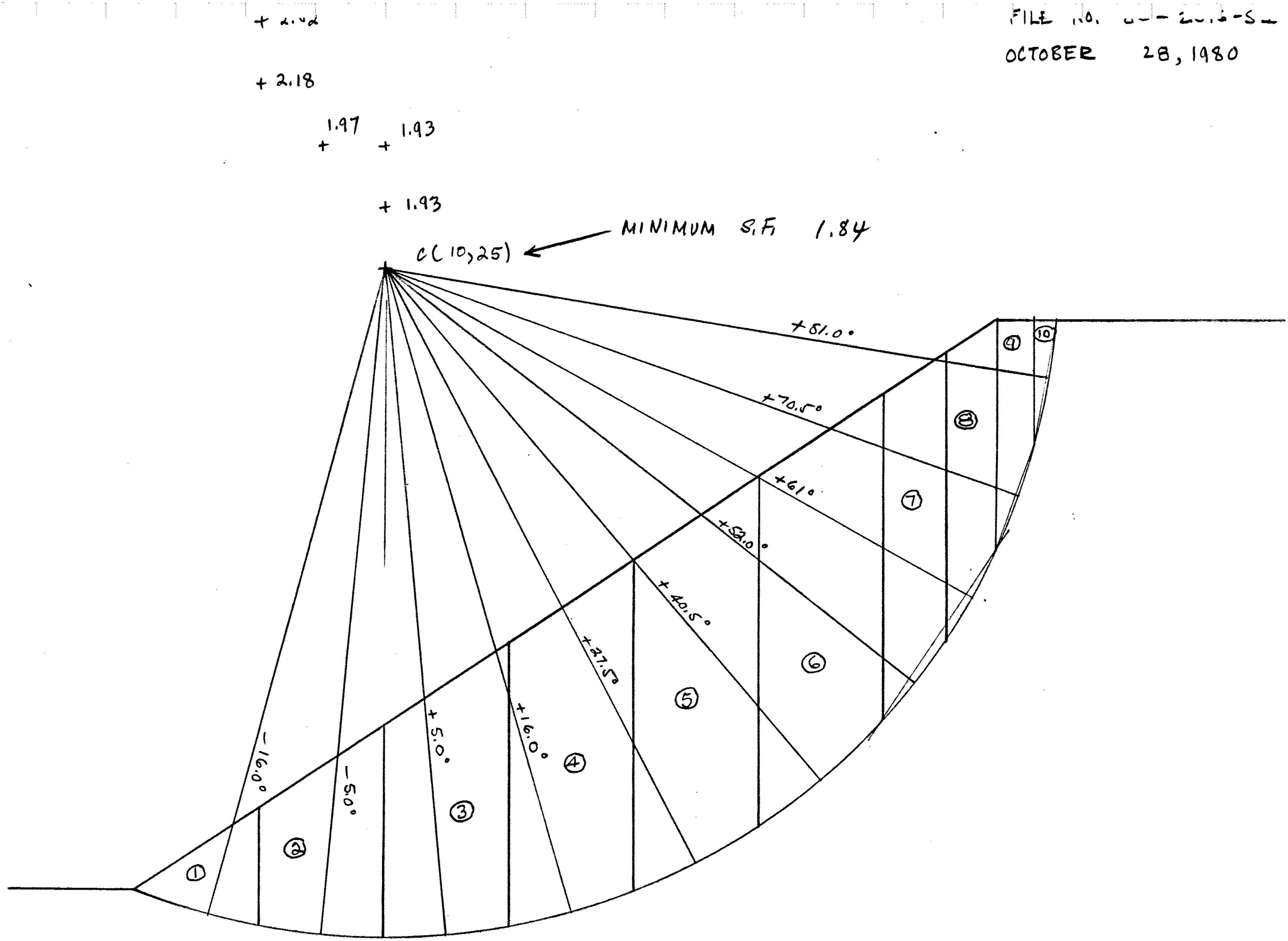


FILE NO. [illegible]
OCTOBER 28, 1980



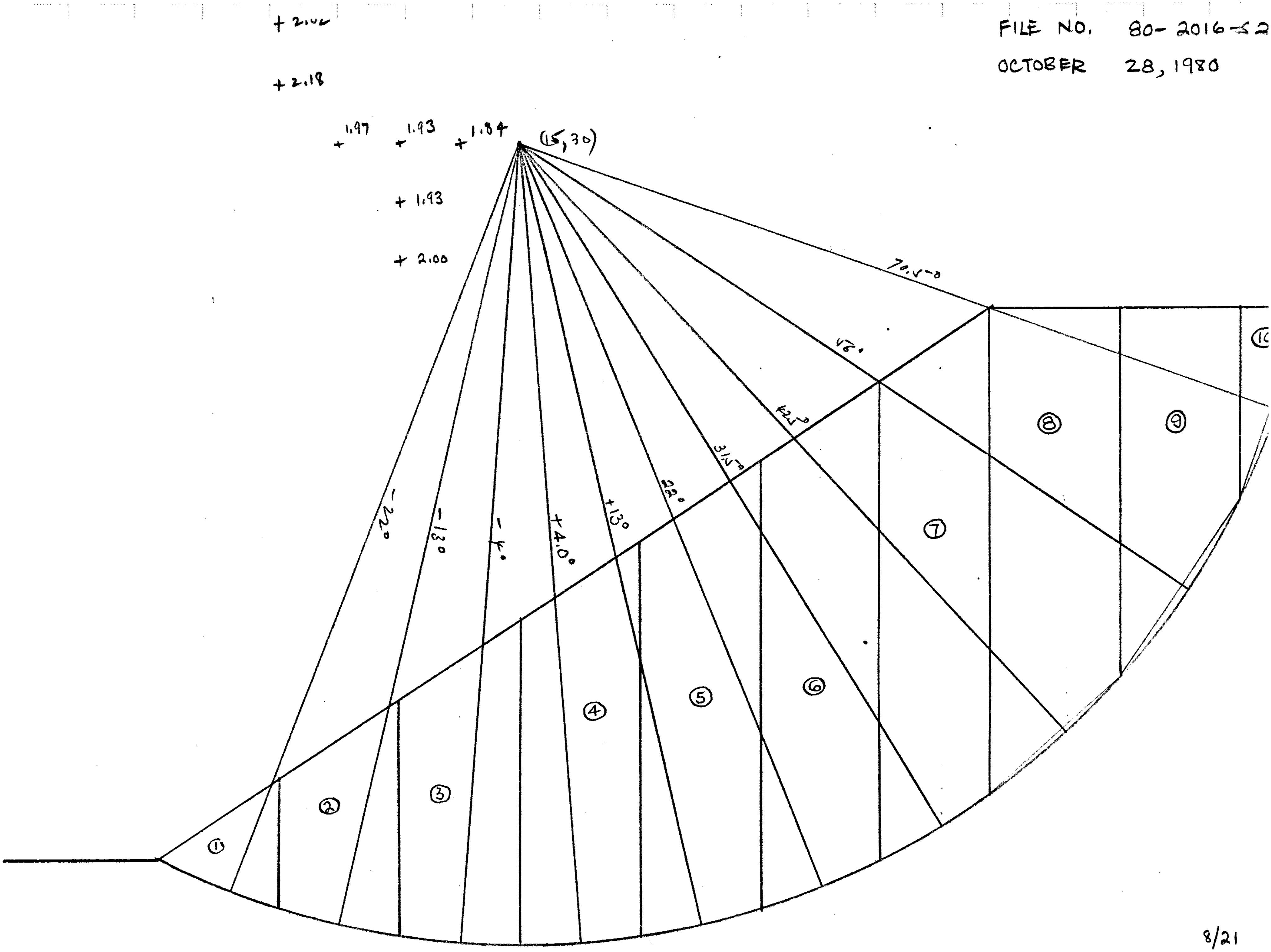
FILE NO. [illegible]

OCTOBER 28, 1980

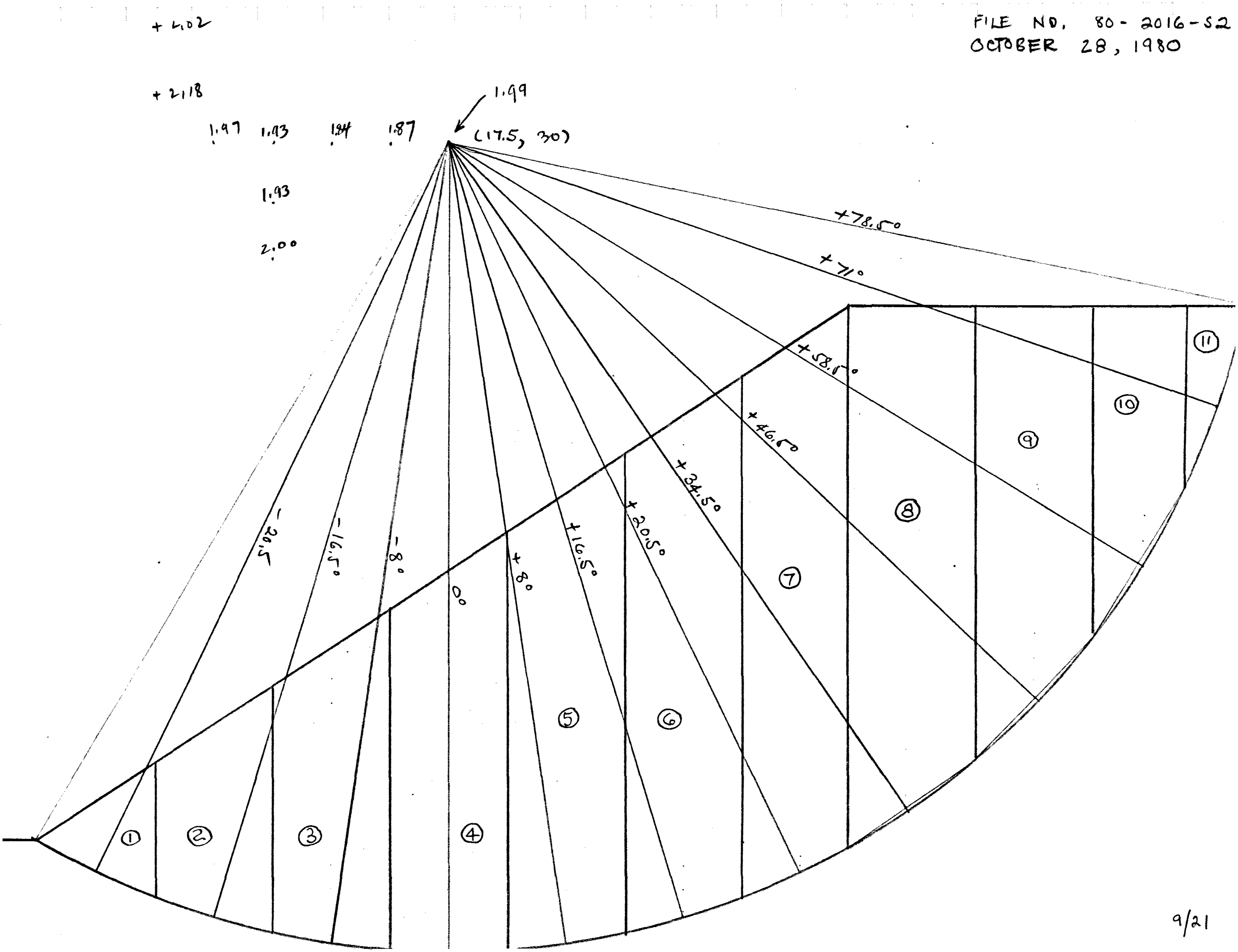


FILE NO. 80-2016-S2

OCTOBER 28, 1980



FILE NO. 80-2016-S2
OCTOBER 28, 1980



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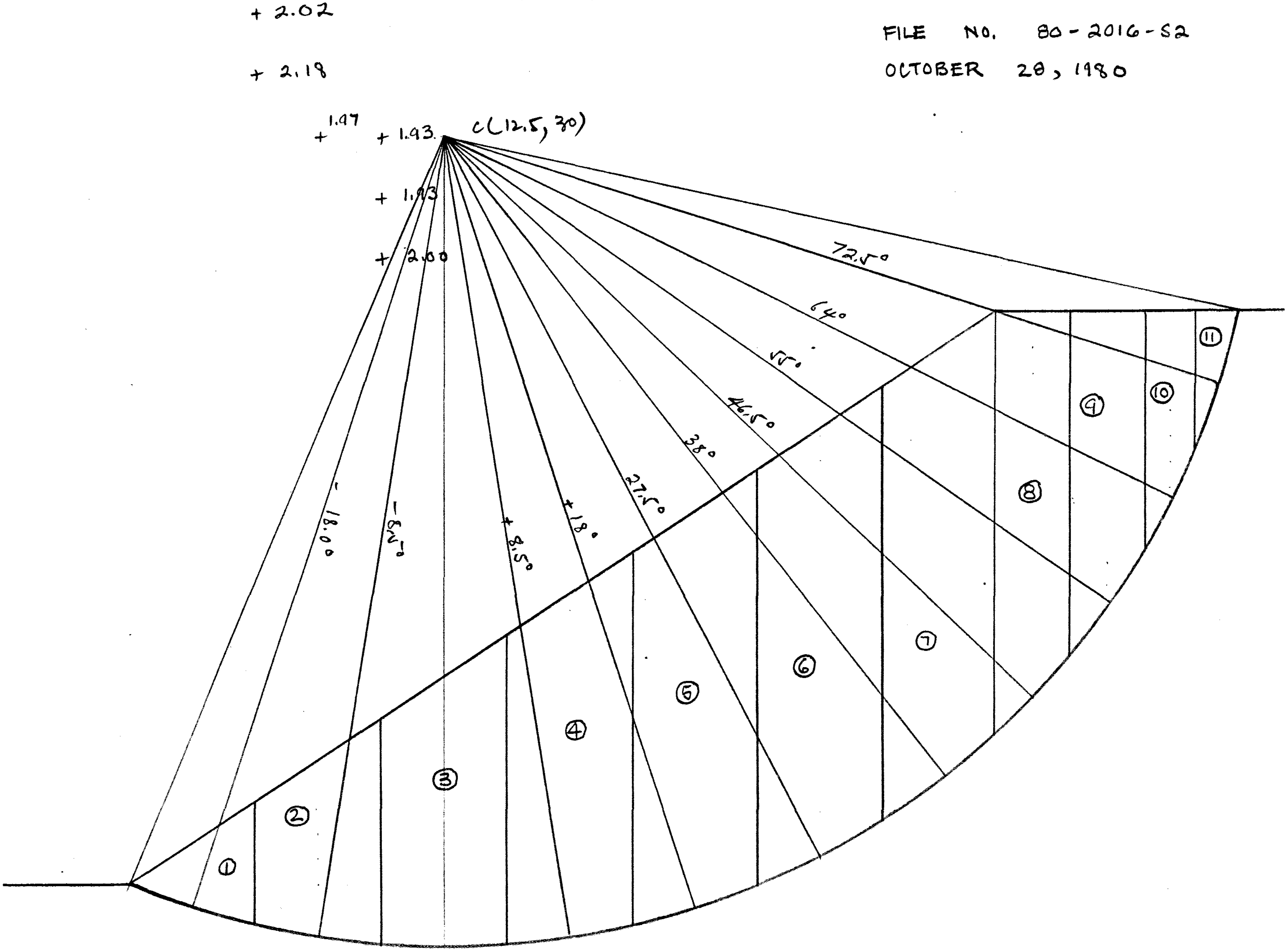
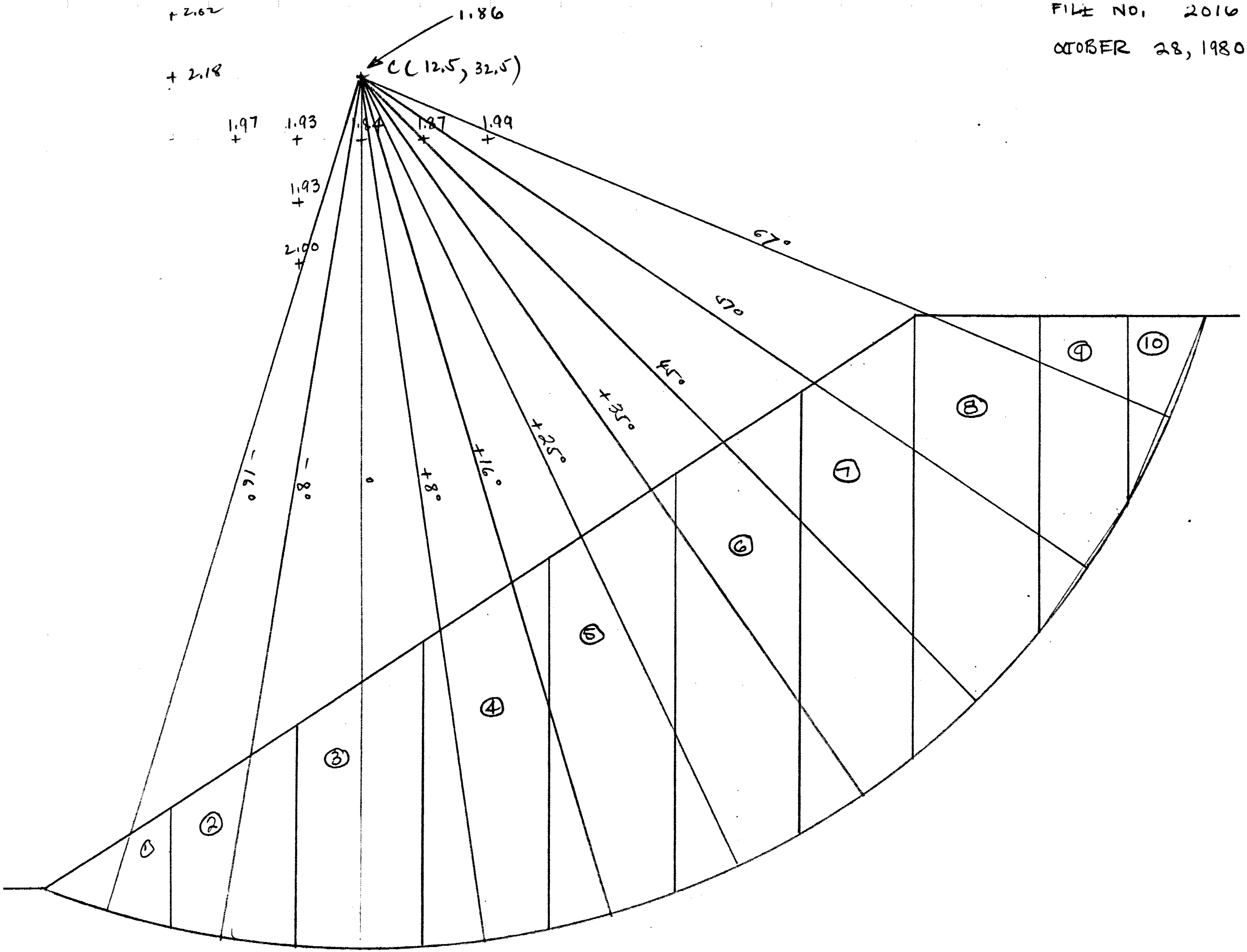
FILE NO. 80-2016-S2
OCTOBER 28, 1980



FILE NO. 2016

OCTOBER 28, 1980



11/2

CTOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE c @ (10,30)

ICE	ΔX	ΔW	α	$\Delta T = \Delta W.\sin(\alpha)$	$\bar{l} = \Delta X/\cos(\alpha)$	$\Delta N = \Delta W \cdot \cos(\alpha)$
1	5	1091.3	-14°	- 263.9	5.15	1058.9
2	5	3152.5	-5.0°	- 274.8	5.02	3140.5
3	5	4704.5	+ 4.5°	+ 369.1	5.02	4690.0
4	5	6062.5	+13.5°	+ 1415.3	5.14	5895.0
5	5	6644.5	+23.0°	+ 2596.0	5.43	6116.3
6	5	7032.5	+33.5°	+ 3881.5	6.00	5864.3
7	5	6693.0	+45.5°	+ 4473.9	7.14	4691.2
8	3	2910.0	+52.0°	+ 2293.1	4.87	1791.6
9	2.9	1125.2	+69.5°	+ 1053.9	8.28	394.0
10						
1					$\Sigma\bar{l}$ = 52.05	

$\Sigma \Delta T_{\oplus} = 16,082.7$ $\quad \Sigma C.\bar{l} = 19,779$ $\quad \Sigma \Delta N = 33,641.8$

$\Sigma \Delta T_{\ominus} = 538.7$

$\Sigma \Delta N . \tan\phi = 10,285.3$

$\Sigma \Delta T = 15,544$

$$S.F. = \frac{\Sigma \Delta N \tan\phi + \Sigma C.\bar{l}}{\Sigma \Delta T} = \frac{10,285.3 + 19,779}{15,544} = 1.93$$

$\underline{S.F. = 1.93 \quad c \ @ \ (10, 30)}$

CTOBER 28, 1980

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COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE c @ (5,35)

ICE	ΔX	ΔW	α	ΔT = ΔW.SIN(α)	$\bar{l}$ = ΔX/cos(α)	ΔN = ΔW. COS(α)
1	5	1018.5	-4.0°	-71.05	5.01	1016.0
2	5	2570.5	+4.0°	+ 191.9	5.01	2564.2
3	5	3783.0	+12.0°	+ 786.5	5.11	3700.3
4	5	4704.5	+20.5°	+ 1647.6	5.34	4406.6
5	5	5189.5	+30.0°	+2594.8	5.77	4494.2
6	5	5092.5	+ 40.0°	+3273.4	6.53	3901.1
7	4.5	3797.6	+ 51.0°	+2951.3	7.15	2389.9
8	3.8	1382.3	+ 63.0°	+ 1231.6	8.37	627.6
9						
10						
11					48.29	

$\sum \Delta T \oplus = 12{,}677.1$ $\sum C.\bar{l} = 18{,}350.3$ $\sum \Delta N = 23{,}100$

$\sum \Delta T \ominus = 71.05$

$\sum \Delta N . \tan \phi = 7062.3$

$\sum \Delta T = 12{,}606.1$

$$S.F. = \frac{7062.3 + 18{,}350.3}{12{,}606.1} = 2.02$$

$\underline{S.F. = 2.02 \ @ \ (5,35)}$

CTOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (5, 32.5)

ICE	ΔX	ΔW	α	$\Delta T = \Delta W.\sin(\alpha)$	$\bar{l} = \Delta X/\cos(\alpha)$	$\Delta N = \Delta W.\cos(\alpha)$
1	5	921.5	-4.5°	-72.3	5.02	918.7
2	5	2570.5	+4.5	+201.7	5.02	2499.8
3	5	3977.0	+14.0°	+962.1	5.15	3858.9
4	5	4704.5	+22.5°	+1800.3	5.41	4346.4
5	5	5092.5	+32.0°	+2698.6	5.90	4318.7
6	5	4753.0	+43.0°	+2341.5	6.84	3476.1
7	4.5	3361.0	+56.5°	+2802.7	8.15	1855.1
8	2.0	485	+69.0°	+452.8	5.58	173.8
9						
10						
11					47.07	

$\sum \Delta T \oplus = 11259.7$ $\sum c.\bar{l} = 17,886.6$ $\sum \Delta N = 21,447.5$

$\sum \Delta T \ominus = 72.3$

$\sum \Delta N.\tan\phi = 6557$

$\sum \Delta T = 11,187.4$

$$F.S. = \frac{17,886.6 + 6557}{11,187.4} = 2.18$$

F.S. = 2.18 C @ (5, 32.5)

OCTOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (7.5, 30)

S ICE	ΔX	ΔW	α	$\Delta T = \Delta W . \sin(\alpha)$	$\bar{l} = \Delta X / \cos(\alpha)$	$\Delta N = \Delta W . \cos(\alpha)$
1	5	994.3	-9.5°	-164.1	5.07	980.7
2	5	2910.0	0	0	5.0	2910.0
3	5	4268.0	+9.5°	+334.9	5.07	4209.5
4	5	5335.0	+19.0°	+1736.9	5.29	5044.3
5	5	5820.0	+29.0°	+2821.6	5.72	5090.3
6	5	5674.5	+41.0°	+3722.8	6.62	4282.6
7	4.5	4753.0	+54.0°	+3845.3	7.66	2793.7
8	3.2	1288.2	+69.0°	+1202.6	8.90	461.6
9						
10						
11					49.33	

$\sum \Delta T \oplus = 13,664.1$ $\sum C.\bar{l} = 18,745.4$ $\sum \Delta N = 25,772.7$

$\sum \Delta T \ominus = -164.1$

$\sum \Delta N . \tan\phi = 7879.5$

$\sum \Delta T = 13,500$

$$F.S. = \frac{7879.5 + 18,745.4}{13,500} = 1.97$$

F.S. = 1.97 C @ (7.5, 30)

TOBER 29, 1980

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COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (10, 27.5)

CE	ΔX	ΔW	α	$\Delta T = \Delta W.\sin(\alpha)$	$\bar{l} = \Delta X / \cos(\alpha)$	$\Delta N = \Delta W \cdot \cos(\alpha)$
1	5	1091.3	-15°	- 282.4	5.18	1054.1
2	5	3152.5	-5°	- 274.8	5.02	3140.5
3	5	4753.0	+ 5°	+ 414.3	5.02	4734.9
4	5	6062.5	+ 15°	+ 1569.0	5.18	5855.9
5	5	6790.0	+ 25°	+ 2869.6	5.52	6153.8
6	5	6935.5	+ 37°	+ 4173.9	6.26	5538.9
7	4.5	5456.3	+ 51°	+ 4240.3	7.15	3433.8
8	2.5	2182.5	+ 62°	+ 1927.0	5.33	1024.6
9	2.0	649.9	+ 75°	+ 627.8	7.73	168.2
10						
1					53.39	

$\sum \Delta T \oplus = 15,821.9$ $\quad \sum C.\bar{l} = 19,908.2$ $\quad \sum \Delta N = 31,104.7$

$\sum \Delta T \ominus = 557.2$

$\sum \Delta N . \tan \phi = 9509.7$

$\sum \Delta T = 15,264.7$

$$F.S. = \frac{9509.7 + 19,908.2}{15,264.7} = 1.93$$

F.S. = 1.93 for C @ (10, 27.5)

TOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE c @ (10,25)

11/21

LICE	ΔX	ΔW	α	$\Delta T = \Delta W.\sin(\alpha)$	$\bar{l} = \Delta X/\cos(\alpha)$	$\Delta N = \Delta W.\cos(\alpha)$
1	5.0	1164.0	-16°	- 320.8	5.20	1118.9
2	5.0	3298.0	- 5°	- 287.4	5.02	3285.5
3	5.0	4995.5	+ 5°	+ 435.4	5.02	4976.5
4	5.0	6062.5	+16°	+ 1671.0	5.20	5827.6
5	5.0	6693.0	+27.5°	+ 3090.5	5.64	5936.8
6	5.0	6693.0	+40.5°	+4346.8	6.56	5089.4
7	2.5	3104.0	+52.0°	+ 2446.0	4.06	1911.0
8	2.0	2037.0	+61.0°	+ 1781.6	4.13	987.6
9	1.5	1018.5	+70.5°	+ 960.1	4.49	340.0
10	1.0	242.5	+81.0°	+ 239.5	6.39	37.9
11					51.71	

$\sum \Delta T \oplus = 14{,}970.9$ $\sum c.\bar{l} = 19{,}649.8$ $\sum \Delta N = 29511.2$

$\sum \Delta T \ominus = 608.2$

$\sum \Delta N.\tan\phi = 9022.$

$\sum \Delta T = 14{,}362.7$

$$S.F. = \frac{9022.5 + 19{,}649.8}{14{,}362.7} = 2.00$$

S.F. = 2.00 for c @ (10,25)

OCTOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (15, 30)

CE	ΔX	ΔW	α	ΔT = ΔW.SIN(α)	$\bar{l}$ = ΔX/COS(α)	ΔN = ΔW • COS(α)
1	5.0	1310	-22°	- 491	5.39	1215
2	5.0	3638	-13°	- 818	5.13	3545
3	5.0	5723	-4°	- 399	5.01	5709
4	5.0	7372	+ 4°	+ 514	5.01	7354
5	5.0	8585	+ 13°	+ 1931	5.13	8365
6	5.0	9361	+ 22°	+ 3507	5.39	8679
7	4.5	8817	+31.5°	+ 4607	5.28	7518
8	5.5	9443	+ 42.5°	+ 6380	7.46	6962
9	5	5675	+ 56.0°	+ 4705	8.94	3173
10	2.5	970	70.5°	+ 914.0	7.49	324
.1					60.23	52844

$\sum \Delta T\oplus = +22{,}558$ $\sum C.\bar{l} = 22{,}887.$ $\sum \Delta N = 52{,}844$

$\sum \Delta T\ominus = -1708$

$\sum \Delta N.\tan\phi = 16{,}156$

$\sum \Delta T = 20{,}850$

$$S.F. = \frac{16{,}156 + 22{,}887}{20{,}850} = 1.87$$

$\underline{S.F. = 1.87 \quad C @ (15, 30)}$

CTOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (17.5, 30)

ICE	ΔX	ΔW	α	$\Delta T = \Delta W.\sin(\alpha)$	$\bar{l} = \Delta X / \cos(\alpha)$	$\Delta N = \Delta W \cdot \cos(\alpha)$
1	5	1431	- 20.5	- 501.	5.34	1340
2	5	4026	-16.5°	- 1143	5.21	3860
3	5	6160	-8°	- 857	5.05	6100
4	5	7469	0°	0	5.0	7469
5	5	9409	+ 8°	+ 1309	5.05	9317
6	5	10428	+ 16.5°	+ 2962	5.21	9999
7	4.5	9952	+ 20.5°	+ 3485	4.80	9322
8	5.5	11,577	+ 34.5°	+ 6557	6.67	9541
9	5	8,245	+ 46.5°	+ 5981	7.26	5675
10	4	4307	+ 58.5°	+ 3672	7.66	2250
11	2.5	946	71.0°	+ 894	7.68	308

$\sum \Delta T \oplus = +24{,}860$ $\sum c.\bar{l} = 24{,}673$ $\sum \Delta N = 65{,}181$

$\sum \Delta T \ominus = -2{,}501$

$\sum \Delta N . \tan\phi = 19{,}928$

$\sum \Delta T = 22{,}359$

$$S.F. = \frac{19{,}928 + 24{,}673}{22{,}359} = 1.99$$

S.F. = 1.99 C@ (17.5, 30)

TOBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (12.5, 20)

LICE	ΔX	ΔW	α	ΔT = ΔW.SIN(α)	$\bar{l}$ = ΔX/COS(α)	ΔN = ΔW.COS(α)
1	5.0	1152	-18°	-356	5.26	1096
2	5.0	3395	-8.5°	-502	5.06	3358
3	5.0	5238	0	0	5.0	5238
	5.0	6645	+8.5°	+982	5.06	6572
5	5.0	7760	+18°	+2398	5.26	7380
6	5.0	8391	+27.5°	+3875	5.64	7443
7	4.5	7508	+38°	+4622	5.71	5916
8	3.0	4511	+46.5°	+3272	4.36	3105
9	3.0	3405	+55.0°	+2789	5.23	1953
10	2.0	1455	+64°	+1308	4.56	638
11	1.7	453	+72.5°	+432	5.65	136

$\Sigma \Delta T\oplus$ = 19,678 $\Sigma C.\bar{l}$ = 21,580 $\Sigma \Delta N$ = 42,835

$\Sigma \Delta T\ominus$ = 858

$\Sigma \Delta N.\tan\phi$ = 13096

$\Sigma \Delta T$ = 18,820

$$S.F._1 = \frac{13,096 + 21,580}{18,820} = 1.84$$

S.F. = 1.84 for C@ (12.5, 20)

MINIMUM S.F.

OBER 28, 1980

COMPUTATION SHEET FOR
SLOPE STABILITY ANALYSIS
CENTER OF FAILURE CIRCLE C @ (12.5, 32.5)

1

E	ΔX	ΔW	α	ΔT = ΔW.SIN(α)	$\bar{l}$ = ΔX/cos(α)	ΔN = ΔW . cos(α)
1	5.0	1152	−16°	− 317	5.20	1107
2	5.0	3395	−8°	− 472	5.05	3362
3	5.0	5190	0°	0	5.00	5190
4	5.0	6548	+8°	+911	5.05	6484
5	5.0	7760	+16°	+2140	5.20	7459
6	5.0	8391	+25°	+3546	5.52	7605
7	4.5	7682	+35°	+4406	5.49	6293
8	5.0	7469	+45°	+5281	7.07	5281
9	3.5	3395	+51°	+2638	5.56	2638
10	3.0	1091	+67°	+1005	7.68	426
1					56.82	

$\sum \Delta T \oplus = +19{,}927$ $\sum C.\bar{l} = 21{,}592$ $\sum \Delta N = 45{,}845$

$\sum \Delta T \ominus = -789$

$\sum \Delta N . \tan\phi = 14{,}016$

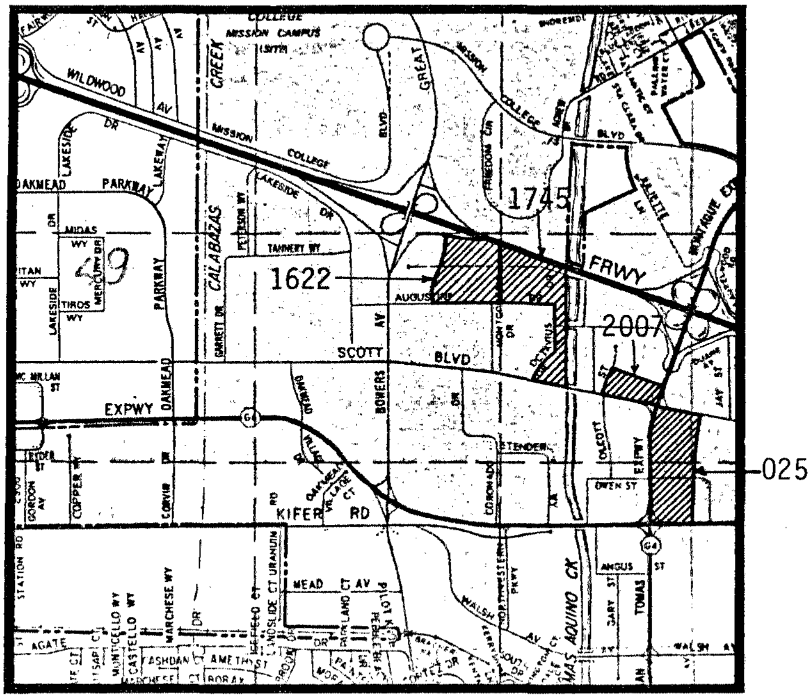
$\sum \Delta T = 19{,}138$

$$S.F. \quad \frac{14{,}016 + 21{,}592}{19138} = 1.86$$

S.F. = 1.86 for C @ (12.5, 32.5)

APPENDIX "B"

BORING LOGS OF ADJACENT PROPERTY EAST AND WEST OF THE CREEK ALIGNMENT

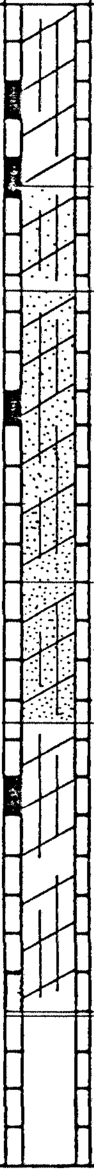


VICINITY MAP

THOMAS BROS MAPS
1978
pg. 53, E-3, F-3 & 4

Logged By: KP Date Drilled: 1/10/78	EXPLORATORY BORING LOG	Hole No. B-1

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY; very stiff, very moist CL Dark gray
93.4	18.7					1-1			
104.3	17.4			1.6	6.1	1-2	5		
									Tan-light brown mottled silty CL CLAY w/occ. fine sand, very mst, very stiff
							10		Light brown sandy silty CLAY CL Very moist, stiff with gray mottling
105.7	21.8					1-3			
							15		
									Light brown silty sandy CLAY; CL ▽ very moist, very stiff
							20		Gray silty CLAY; very moist, CL firm-stiff
99.6	26.0					1-4			
							25		
NO RECOVERY						1-5			
									Boring terminated at 26 feet

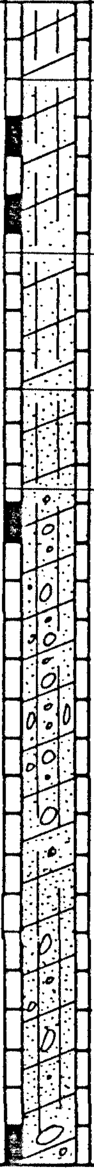
Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-2
Date Drilled: 1/10/78		

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY; very moist, very stiff CL
103.4	17.0					2-1			Gray-brown silty CLAY; w/occ. fine sand, moist, stiff CL
							5		
105.9	17.8		5.3			2-2			
									Tan-light brown silty CLAY; w/occ. fine sand, moist, stiff CL
							10		
									Tan mottled-sandy silty CLAY; CL ▽ very moist, very stiff
100.2	25.3					2-3			Gray-green mottled silty CLAY w/ occ. fine gravels CL
							15		
									Grading to blue-gray
									Increasing in sand
							20		
									Sandy silty CLAY; blue-gray CL
						2-4			No recovery
							25		
									Medium gray-brown mottled sandy silty CLAY CL
103.3	24.4					2-5	30		

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-2 (Cont'd)
Date Drilled: 1/10/78		

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION	
				"C" k.s.f.	"Ø" Degree					
								▨	Sandy silty CLAY	CL
									Boring terminated at 31 feet	

Remarks:

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

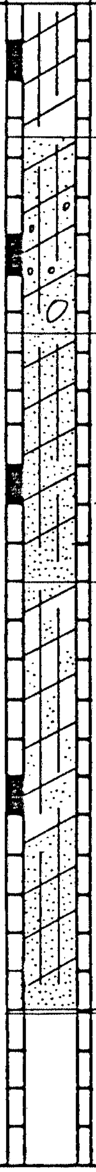
Logged By: KP

Date Drilled: 1/10/78

EXPLORATORY BORING LOG

Hole No. B-3

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
89.9	29.9					3-1			Black silty CLAY; very moist CL very stiff Grading to gray-brown
							5		Tan-light brown sandy silty CLAY moist, stiff CL Grading to tan-light brown mottled
116.8	11.3					3-2			Sandy gravelly CLAY; mst, v. stiff
							10		Tan sandy silty CLAY; moist CL very stiff Increase in silt and sand w/ clay ▽ binder
92.9	28.6					3-3			
							15		Blue-gray silty CLAY w/ occ. CL pockets of fine sand in clay matrix Very moist, stiff
							20		
98.2	26.5					3-4			Gray silty CLAY; firm CL w/increased sand
							25		
NO RECOVERY						3-5			Boring terminated at 26 feet

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

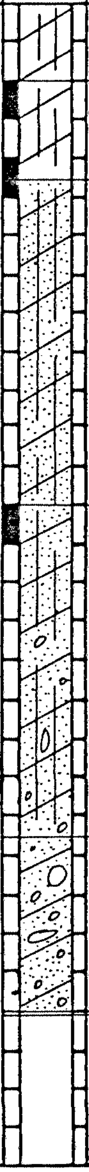
Logged By: KP

Date Drilled: 1/10/78

EXPLORATORY BORING LOG

Hole No. B-4

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY; very moist very stiff CL
98.7	16.9					4-1			Dark brown silty CLAY; very moist very stiff CL
107.0	16.6					4-2	5		Tan-light brown mottled sandy silty CLAY; moist, very stiff CL
							10		
103.6	22.7					4-3			▽ Light brown mottled sandy silty CLAY w/occ. gravels CL moist, stiff
							15		
									to a
									sandy CLAY CL
							20		Sandy CLAY w/dense sandy layers
NO RECOVERY						4-4			to a clayey sand CL
									Light gray sandy gravelly CLAY; very moist, stiff CL
							25		
NO RECOVERY						4-5			
									Boring terminated at 26 feet

Remarks:

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

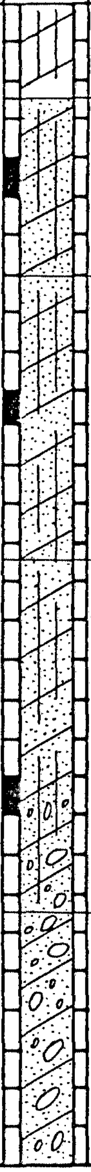
Logged By: KP

Date Drilled: 1/10/78

EXPLORATORY BORING LOG

Hole No. B-5

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"ø" Degree				
									Black silty CLAY; very moist CL stiff
107.4	16.9					5-1	5		Tan-light brown sandy silty CLAY; moist, very stiff CL w/occ. small rock fragments
103.3	22.7					5-2	10		Gray-brown mottled sandy silty CLAY; very moist, very stiff CL
							15		∇ Gray-brown sandy silty CLAY; very moist, very stiff CL
105.8	20.9					5-3	20		Gray sandy GRAVEL w/minor clay binder, very moist, very dense GP
							25		Gray-brown sandy gravelly CLAY; very moist, stiff CL
							30		

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP

Date Drilled: 1/10/78

EXPLORATORY BORING LOG

Hole No. B-5 (Cont'd)

Job No. 8-025-S1

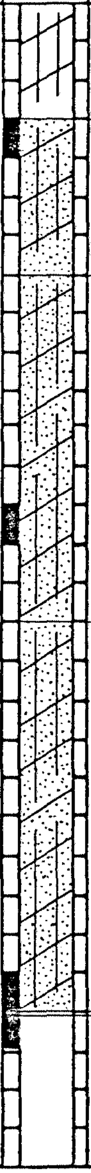
Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
NO RECOVERY						5-4	31	▨	*
									Boring terminated at 31 feet

Remarks: *Gray-brown sandy gravelly CLAY; very moist, stiff

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-6
Date Drilled: 1/10/78		Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY; very moist CL stiff
107.4	16.0			.6	26.1	6-1	5		Tan-light brown mottled sandy silty CLAY; moist, very stiff CL
							10		Light brown silty sandy CLAY; CL very moist, stiff Grading to ▽ silty SAND w/little clay SM very dense (very clean sands)
103.4	23.1					6-2	15		
							20		Gray-brown sandy silty CLAY; CL very moist, very stiff (decrease clay)
							25		Blue-gray (color change) w/isolated sand lenses at 24-26 feet
115.4 106.1	17.2 21.0					6-3-1 6-3-2			Boring terminated at 26 feet

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

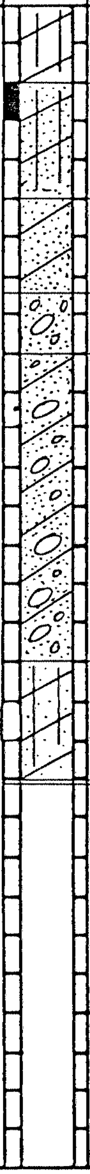
Logged By: KP

Date Drilled: 1/10/78

EXPLORATORY BORING LOG

Hole No. B-7

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY; very moist stiff CL
101.7	17.5					7-1			Gray-brown sandy silty CLAY; moist, very stiff CL
							5		Tan-light brown sandy CLAY; very moist, very stiff CL
									Gray-brown sandy GRAVEL;* GP
NO RECOVERY						7-2	10 15		Gray-brown mottled sandy gravelly ∇ CLAY; moist, very stiff CL Decrease clay to clayey sandy gravel
NO RECOVERY						7-3	20		Blue-gray silty CLAY w/minor sand, very moist, stiff CL
									Boring terminated at 20 feet

Remarks: *Very moist, very dense ½ inch diameter

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

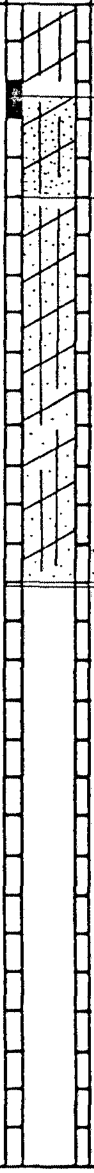
Longed By: KP

Date Drilled: 1/10/78

EXPLORATORY BORING LOG

Hole No. B-8

Job No. 8-025-S1

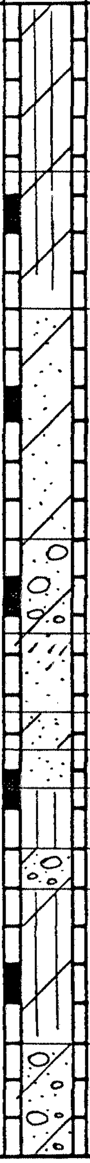
Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY; very moist CL stiff
103.1	18.1					8-1	5		Light-gray-brown mottled sandy silty CLAY; moist, very stiff CL
									Light brown silty CLAY w/occ. CL sand
							10		Green-brown sandy silty CLAY CL
							15		∇
									Boring terminated at 15 feet

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: TN Date Drilled: 3/15/78	EXPLORATORY BORING LOG	Hole No. B-9

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	Job No. 8-025-S1 DESCRIPTION
									Black silty CLAY - moist, stiff, grading to dark brown CL
							5		
99.2	25.4		6.2*			9-1			Mottled light gray and light brown silty CLAY, moist, stiff
							10		Medium brown mottled sandy CLAY CL
99.8	25.4					9-2			▼
									▽
							15		Gray-brown wet, dense sandy CLAY with gravel to 1½" CL
NO RECOVERY						9-3			
									Gray SILT grading to fine sand ML
							20		Gray slightly clayey fine-**
									Gray clean fine-medium SAND SC
		36				9-4			Gray clean fine-medium SAND, damp, dense SC
									Gray SILT, damp, very stiff MH
							25		Gray sandy CLAY with scattered gravel, wet, dense CL
97.6	25.5					9-5			Gray, brown, mottled silty CLAY moist, stiff CL
							30		Gray-blue clayey SAND & GRAVEL

Remarks: * field tested
** medium SAND SC

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: TN

Date Drilled: 3/15/78

EXPLORATORY BORING LOG

Hole No. B-9 (2 of 2)

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
NO RECOVERY						9-6	31		wet, dense SP
									Boring terminated @ 31
							35		

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

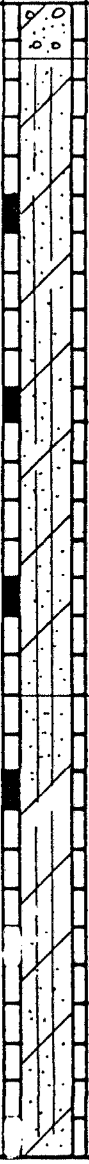
Logged By: TN

Date Drilled: 3/15/78

EXPLORATORY BORING LOG

Hole No. B-10

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"Ø" Degree				
									Dark gray, loose (to 1") to stiff sandy CLAY with scattered gravel CL
									Brown damp sandy CLAY with much silt- firm to stiff
							5		grades to
101.5	23.4					10-1			brown silty clay with caliche
									grades to sandy clay - damp, stiff
							10		
107.5	20.5		3.6*			10-2			▽ brown grading to clayey sand- damp to wet, compact
									back to
							15		
101.7	24.6					10-3			brown, gray mottled sandy clay
							20		Color changing to gray, sandy SILT, compacy, damp - grades to gray moist stiff clayey silt - grades to silty clay - moist, stiff ML
94.8	28.7					10-4			
							25		gray clayey sand and sandy clay - scattered gravel, wet, dense
							30		

Remarks: * field tested

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: TN Date Drilled: 3/15/78	EXPLORATORY BORING LOG	Hole No. B-10 (2 of 2)

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"ø" Degree				
									Boring terminated @ 31'
							35		

Remarks:

- Log of Test Boring

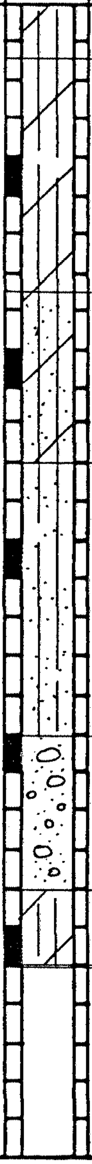
UNITED SOIL ENGINEERING, INC.

Logged By: TN Date Drilled: 3/15/78	EXPLORATORY BORING LOG	Hole No. B-11

Job No.8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	DESCRIPTION
								Gray silty CLAY, loose to 9", dry moist CL
104.5	22.2		4.4*			11-1	5	Brown silty CLAY - moist, stiff- some caliche CL
100.3	24.7					11-2	10	Brown, gray mottled sandy CLAY and silty clay, moist, stiff CL
101.9	23.4					11-3	15	Brown, some gray, interbedded layers of SAND (medium grained and coarse grained) and silt SM
		70+				11-4	20	Color changing to gray; dense, wet SAND with scattered gravel to 1½"
NO RECOVERY						11-5	25	Gray clayey SILT ML
								Boring terminated @ 25'

Boring Log



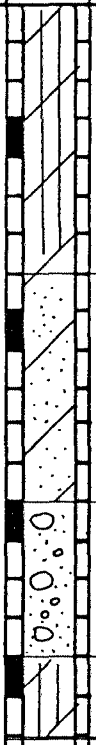
Remarks: * field tested

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: TN Date Drilled: 3/15/78	EXPLORATORY BORING LOG	Hole No. B-12

Job No. 8-025-S1



Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
99.4	26.3					12-1	5		Dark gray, loose (to 10") to stiff slightly moist to moist, silty CLAY CL
95.6	27.5					12-2	10		Brown sandy CLAY and interbedded ▼ clayey sand, damp to wet, stiff CL
114.8	13.3					12-3	15		Light gray dense, wet, clean SAND & GRAVEL SP
NO RECOVERY						12-4			Gray moist SILT to clayey silt ML
							20		Boring terminated @ 19'

Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

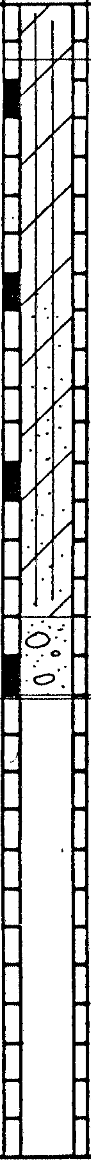
Logged By: TN

Date Drilled: 3/15/78

EXPLORATORY BORING LOG

Hole No. B-13

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Dark gray loose (to 8") to stiff silty CLAY, moist at 5' CL
101.8	22.4					13-1			Dark brown moist, stiff, silty CLAY CL
							5		
109.2	19.4		2.4*			13-2			grades to slightly sandy clay, moist, stiff
									▽
							10		
98.3	25.6					13-3			Brown, gray-mottled sandy clay and clayey sand, wet, stiff
							15		
120.8	11.8					13-4			Gray-brown dense wet SAND & GRAVEL SW
									Boring terminated @ 18'
							20		

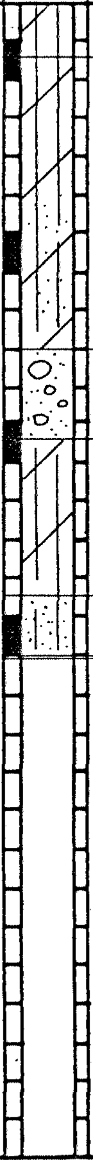
Remarks: * field tested

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: TN	EXPLORATORY BORING LOG	Hole No. B-14
Date Drilled: 3/15/78		

Job No. 8-025-S1



Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	DESCRIPTION
								Dark gray loose (to 1") silty CLAY CL
103.0	23.2		4.4*			14-1		Brown silty CLAY, moist, stiff CL
							5	some sandy clay below 5'
102.3	23.4					14-2		
							10	Gray-brown SAND & GRAVEL SW
106.5	21.0					14-3		Brown, gray mottled silty CLAY- moist, stiff CL
							15	
NO RECOVERY						14-4		Brown dense damp fine slightly silty SAND SM
								Boring terminated @ 17'

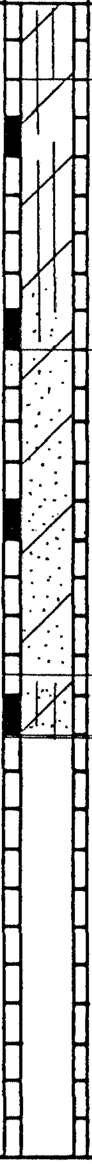
Remarks: *field tested

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: TN Date Drilled: 3/15/78	EXPLORATORY BORING LOG	Hole No. B-15

Job No. 8-025-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black moist, stiff silty CLAY CL (loose to 6" only)
102.1	23.2					15-1			Brown moist, stiff, silty CLAY CL
							5		
108.8	20.8					15-2			grades to interbedded silty clay and clayey sand, damp to wet, ∇ stiff
							10		Brown wet clayey SAND-slightly compact SC
114.0	19.4					15-3			
							15		
NO RECOVERY						15-4			Dark gray clayey SILT with thin wet sand layers (dense) ML
							20		Boring terminated @ 19'

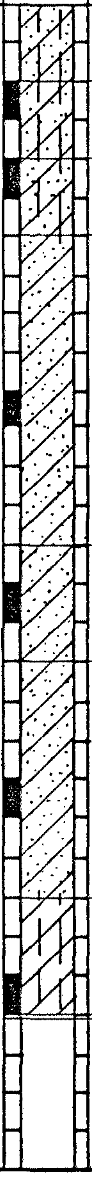
Remarks:

- Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: RH Date Drilled: 6/2/76	EXPLORATORY BORING LOG	Hole No. B-1

Job No. 6-1622-S1



Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	DESCRIPTION
							1	Lt. choc. brown sandy silty CLAY; damp CL
91.4	18.9					1-1		Dk. brown sandy silty CLAY; damp; stiff CL
						1-2	5	Brown sandy silty CLAY; slightly damp; very stiff CL
79.1	27.2					1-3	10	Limonitic light gray sandy CLAY; damp; firm CL ▼ ▼
						1-4	15	Olive gray sandy CLAY; wet; firm CL
97.0	26.5					1-5	20	becoming uniformly dark gray; firm CL
						1-6	25	Limonitic gray silty CLAY; moist; firm CL
								Boring terminated @ 26'

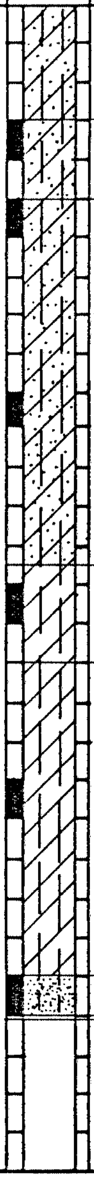
Remarks:

- Log of Boring #1

UNITED SOIL ENGINEERING, INC.

Logged By: RH Date Drilled: 6/2/76	EXPLORATORY BORING LOG	Hole No. B-2

Job No. 6-1622-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"ø" Degree				
							1		Dark brown sandy silty CLAY; slightly damp CL
						2-1			Very dk. brown sandy silty CLAY; slightly damp; firm CL
105.8	20.1		8.3			2-2	5		▼ Light brown sandy silty CLAY with caliche, damp, very stiff CL
									▼ increasing organic content to approximately 15-20%; firm
						2-3	10		
90.8	31.8					2-4	15		Limonitic light green silty CLAY; firm CL
									Dark gray silty CLAY; wet; firm CL
						2-5	20		increasing stiffness
104.7	20.8					2-6	25		(LIQ) olive green silty SAND; SM wet; firm
									Boring terminated @ 26'

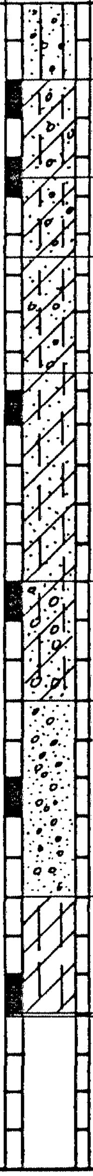
Remarks:

- Log of Boring #2

UNITED SOIL ENGINEERING, INC.

Logged By: RH	EXPLORATORY BORING LOG	Hole No. B-3
Date Drilled: 6/2/76		

Job No. 6-1622-S1



Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	DESCRIPTION
							1	Red-brown gravelly clayey sandy SILT; slightly damp SM
91.5	29.4					3-1		Limonitic dark gray gravelly sandy silty CLAY; damp; very stiff CL
						3-2	5	Red-brown gravelly sandy silty CLAY; slightly damp; firm CL
								Lt. choc. brown gravelly sandy silty CLAY; damp CL
118.5	10.4					3-3	10	Limonitic lt. gray sandy silty ▼ CLAY with caliche; damp; stiff CL
						3-4	15	increasing sand and gravel and color change to reddish-brown and dark grayish CL
						3-5	20	Silty gravelly SAND; wet; very stiff SP
						3-6	25	Dark gray silty CLAY; wet; soft CL
								Boring terminated @ 26'

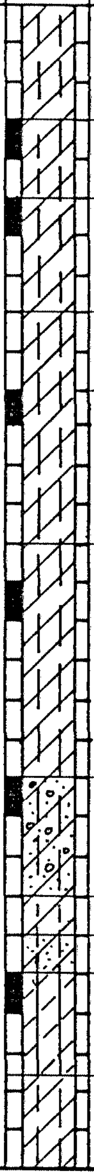
Remarks:

- Log of Boring #3

UNITED SOIL ENGINEERING, INC.

Logged By: RH	EXPLORATORY BORING LOG	Hole No. B-4
Date Drilled: 6/2/76		

Job No. 6-1622-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"ø" Degree				
							1		Dark brown silty CLAY; slightly damp CL
92.1	21.0					4-1			Choc. brown silty CLAY; dry; stiff CL
						4-2	5		Brownish-black silty CLAY with caliche; slightly damp; very stiff CL
92.3	31.2					4-3	10		Limonitic light greenish-gray ▼ silty CLAY with organic material; soft CL
						4-4	15		Limonitic dark olive gray silty CLAY; firm CL
102.4	23.9					4-5	20		Dark gray gravelly sandy silty CLAY; damp, firm CL
									Dk.gray silty clay; v.stiff CL
									Lt.gray sandy silty CLAY; moist
						4-6	25		Dark gray and olive green clayey SILT; very moist; firm ML
									Dark gray and olive green silty CLAY; moist; soft CL
							30		

Remarks:

Boring continued....

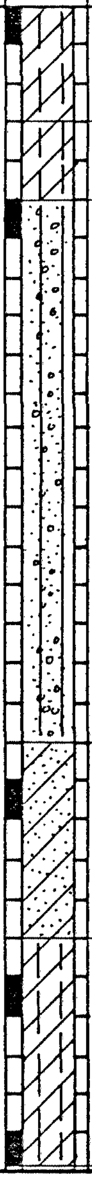
- Log of Boring #4

UNITED SOIL ENGINEERING, INC.

Logged By: RH	EXPLORATORY BORING LOG	Hole No. B-4 continued
Date Drilled: 6/2/76		

Job No. 6-1622-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"Ø" Degree				
						4-7	31		silty clay continued...
									Dk. olive green silty CLAY; very moist CL
						4-8	35		Dk. olive green gravelly sandy SILT; wet; very soft SM
							40		no sample, hole sloughed 3' deep with sand and gravel...
							45		
						4-9	50		Limonitic light gray sandy CLAY; moist; soft CL
						4-10	55		Dark gray silty CLAY with some caliche; damp; firm CL
						4-11	60		color change to dark blue to gray



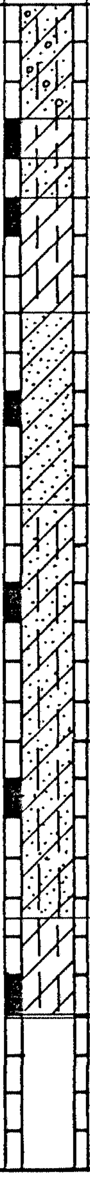
Boring terminated @ 60'

Remarks:

UNITED SOIL ENGINEERING, INC.

Logged By: RH Date Drilled: 6/2/76	EXPLORATORY BORING LOG	Hole No. B-5

Job No. 6-1622-S1

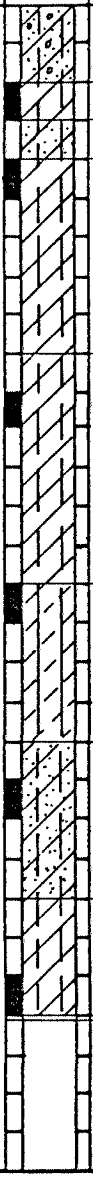
Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "φ" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Red-brown gravelly sandy silty CLAY; dry CL
94.9	22.8					5-1			Gray-black silty CLAY; sl.dampCL
									Red-brown sandy silty CLAY; dry
98.8	25.3		5.8			5-2	5		Grayish black silty CLAY; slightly damp; stiff CL
91.9	28.5					5-3	10		Limonitic light greenish-brown sandy CLAY; slightly damp; soft CL
101.1	25.5					5-4	15		▼ Mottled limonite and dark gray sandy silty CLAY with some organic material; damp; firm CL
96.6	28.7					5-5	20		soft
						5-6	25		Dark gray silty CLAY with pebbles of harder clay; some caliche; moist; firm CL
									Boring terminated @ 26'

Remarks:

- Log of Boring #5

UNITED SOIL ENGINEERING, INC.

Logged By: RH	EXPLORATORY BORING LOG	Hole No. B-6
Date Drilled: 6/2/76		

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	Job No. 6-1622-S1 DESCRIPTION
							1		Red-brown gravelly sandy silty CLAY; slightly damp CL
92.2	24.3					6-1			Black silty CLAY; sl. damp CL
									Red-brown sandy silty CLAY CL
						6-2	5		Brownish-black silty CLAY; slightly damp; very stiff CL
						6-3	10		Mottled limonitic and greenish-gray silty CLAY with organic material; damp; soft CL ▼ decreasing organic material
						6-4	15		Reddish-brown clayey SILT with caliche; wet; soft ML
						6-5	20		Limonitic dark gray sandy silty CLAY; damp; soft CL
						6-6	25		Mottled dk.blue-gray & olive green silty CLAY with pebbles of harder clay; damp; some organics; caliche; soft CL
									Boring terminated @ 26'

Remarks:

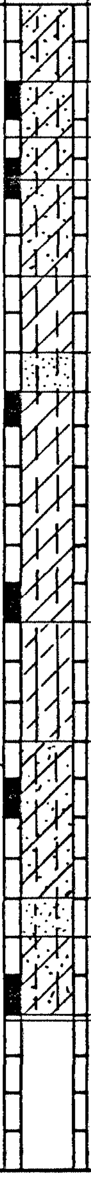
- Log of Boring #6

UNITED SOIL ENGINEERING, INC.

Logged By: RH	EXPLORATORY BORING LOG	Hole No. B-7
Date Drilled: 6/2/76		

Job No. 6-1622-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Lt. choc. brown sandy silty CLAY; slightly damp CL
						7-1			Brownish-black sandy silty CLAY; slightly damp; very stiff CL
						7-2			Light brown sandy silty CLAY CL
							5		Dark brownish-black sandy silty CLAY with caliche; very stiff CL
									Mottled limonite & green-gray silty CLAY with caliche; damp CL
									Brownish-gray clayey silty SAND
95.5	28.5		2.3			7-3	10		Mottled limonite and green-gray silty CLAY with caliche; slightly damp; soft CL
						7-4	15		moist; soft
									Mottled brown and light gray limonitic clayey SILT; wet ML
						7-5	20		Limonitic dark gray sandy silty CLAY; soft CL
									(LIQ) dark gray silty SAND SM
						7-6	25		Mottled brown & light gray sandy silty CLAY with caliche; firm CL
									Boring terminated @ 26'

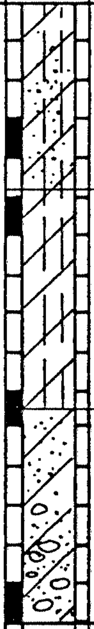


Remarks:

- Log of Boring #7

UNITED SOIL ENGINEERING, INC.

Logged By: KP Date Drilled: 12-8-76	EXPLORATORY BORING LOG	Hole No. B-1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	Job No. 6-1745-S1 DESCRIPTION
							1		Medium brown silty CLAY with occasional sand; slightly moist; very stiff CH
99.8	18.8					1-1			
							5		
104.2	19.4					1-2			Light brown silty CLAY; very moist; very stiff CL
							10		▼
104.9	22.0					1-3			Mottled light brown and gray sandy CLAY; grading to clayey gravelly SAND; very moist; very stiff CL-SP
							15		
						1-4			
									Boring terminated @ 16'

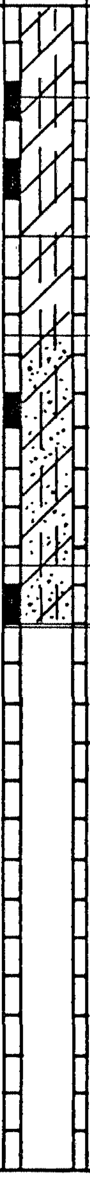
Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-2
Date Drilled: 12-8-76		

Job No. 6-1745-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Medium to dark brown silty CLAY; slightly moist; very stiff CH
96.3	17.6					2-1			Mottled cream to medium brown silty CLAY; slightly moist to moist; very stiff CL
107.7	16.6					2-2			
							5		
									Tan silty CLAY; very moist; stiff CL
									Tan sandy silty CLAY; very moist; very stiff CL
99.2	25.3					2-3	10		▼
95.8	26.6					2-4	15		Gray-brown clayey silty SAND SM very moist; stiff
									Boring terminated @ 16'

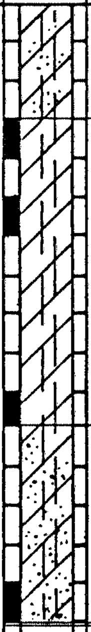
Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-3
Date Drilled: 12-8-76		

Job No. 6-1745-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Medium brown silty CLAY with occasional fine sand; dry to slightly damp; very stiff CH
100.2	24.3			1.2	26	3-1			Mottled cream to medium brown silty CLAY; grading to tan silty CLAY; very moist; stiff CL
110.8	17.9					3-2	5		
94.9	24.0					3-3	10		
									▼ Gray-brown clayey silty SAND; very moist; dense SM
						3-4	15		
									Boring terminated @ 16'

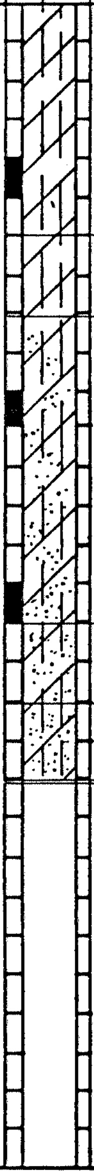
Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-4
Date Drilled: 12-8-76		

Job No. 6-1745-S1



Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Medium to dark brown silty CLAY; slightly moist; very stiff CH to mottled cream and medium brown
102.3	16.5					4-1	5		
									Tan silty CLAY; very moist; stiff CL
99.6	16.8					4-2	10		Tan to light brown clayey silty SAND; very dense; slightly moist SM ▼ occasional gravels
						4-3	15		
									Light brown sandy silty CLAY; very moist; very stiff CL
									Gray-brown sandy silty CLAY; very moist; very stiff CL
									Boring terminated @ 20'

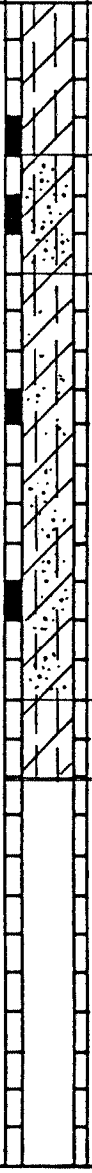
Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No.
Date Drilled: 12-8-76		B-5

Job No. 6-1745-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Medium brown to black silty CLAY; slightly moist; very stiff CH
92.6	21.3					5-1			
109.6	19.1					5-2	5		Light brown to cream silty CLAY with occasional sand; slightly moist; stiff CL
									Tan mottled silty CLAY; very moist; very stiff CL
98.8	26.9					5-3	10		increasing sand content... ▼
91.2	32.1					5-4	15		
									Blue-gray silty CLAY; very moist; stiff CL
							20		Boring terminated @ 20'

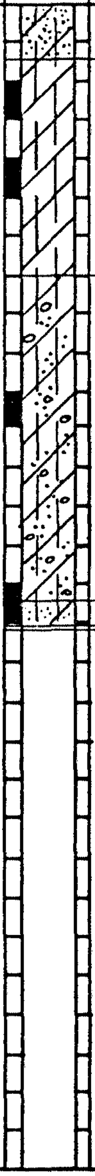
Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP	EXPLORATORY BORING LOG	Hole No. B-6
Date Drilled: 12-8-76		

Job No. 6-1745-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Medium brown sandy silty CLAY; dry to sl. moist; very stiff CH
89.1	22.3					6-1			Black silty CLAY; moist; very stiff CH
105.1	21.0					6-2	5		gray-brown color to mottled brown and cream
									Light brown silty CLAY with occasional coarse sand and fine gravel CL
94.6	28.2					6-3	10		
							15		▼
95.8	27.9					6-4			Mottled brown clayey silty SAND SM
									Boring terminated @ 16'

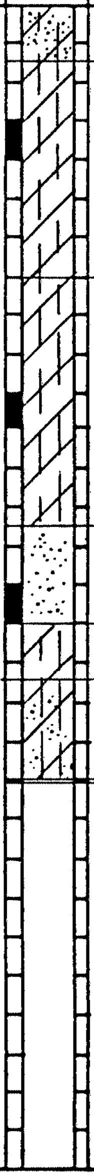
Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: KP Date Drilled: 12-8-76	EXPLORATORY BORING LOG	Hole No. B-7

Job No. 6-1745-S1

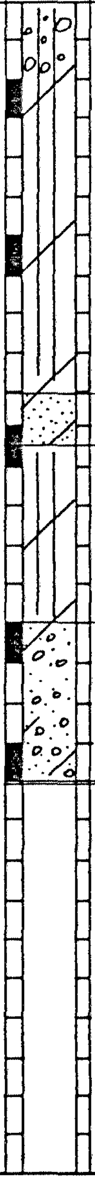
Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
							1		Medium brown sandy silty CLAY; slightly moist CH
104.8	16.9					7-1			Dark gray-brown silty CLAY; moist; very stiff CL
							5		
									Tan silty CLAY; very moist; very stiff CL
90.2	31.5					7-2	10		▼
									Clean SAND; wet; very dense SW
95.2	23.1					7-3	15		
									Light brown silty CLAY; very moist; very stiff CL
									Gray-blue silty CLAY with minor sand; very moist; very stiff CL
							20		
									Boring terminated @ 20'

Remarks:

Log of Boring

UNITED SOIL ENGINEERING, INC.

Logged By: AR Date Drilled: 6-17-80	EXPLORATORY BORING LOG	Hole No. B-1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	Job No. 80-2007-S1 DESCRIPTION
90.0	17.1	65				1-1			Dark brown to black silty CLAY with desiccation cracks, some surface gravel, dry, loose due to cultivation, very stiff, damp to dry, changing color to tan nodules and cementation by caliche stiff, moist CI ▼
							5		
104.2	22.0					1-2			
							10		▽ Light brown fine-grained sandy *
98.7	25.7					1-3			Mottled brown and tan silty CLAY with caliche streaks CL stiff, moist changing color to blue-green
							15		
104.5	21.4	51				1-4			Mottled blue-green fine-grained SAND with clay binder and pea-gravel, dense, wet up to 1½" in diameter rounded **
NO RECOVERY		62				1-5	20		
									Boring terminated @ 20'

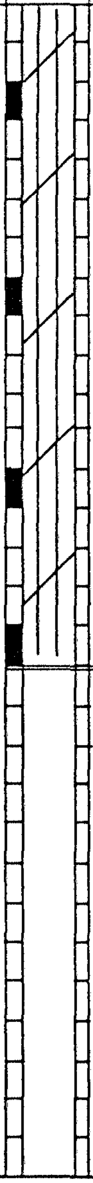
Remarks: *CLAY, firm, wet CL
**pebbles

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: AR	EXPLORATORY BORING LOG	Hole No. B-2
Date Drilled: 6-17-80		

Job No. 80-2007-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"Ø" Degree				
98.2	21.9			.9	10.7	2-1			Dark brown to black silty CLAY with desiccation cracks, loose, stiff, damp changing color to mottled light brown and tan
							5		nodules and cementation by caliche CI
									▼
104.5	21.2					2-2			stiff, moist
							10		▽
93.3	30.0					2-3			stiff, very moist
							15		caliche streaks and percolation holes
104.7	21.4	56				2-4			
									Boring terminated @ 17'

Remarks:

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

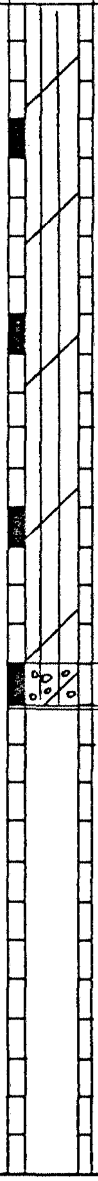
Logged By: AR

Date Drilled: 6-17-80

EXPLORATORY BORING LOG

Hole No. B-3

Job No. 80-2007-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION
									Black silty CLAY with desiccation cracks, loose, dry
103.7	19.3					3-1	5		stiff, damp changing color to light brown and tan with caliche nodules and cementation ▼
89.3	33.6					3-2	10		stiff, moist ▽ mottled brown and blue
95.5	28.6					3-3	15		stiff, very moist
97.0	25.8					3-4			Blue-green silty CLAY with *
									Boring terminated @ 18'

Remarks: *trace of organics and shell fragments, stiff, very moist, pea-gravels (old bay mud ?)

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: AR	EXPLORATORY BORING LOG	Hole No. B-4	
Date Drilled: 6-17-80			

Job No. 80-2007-S1

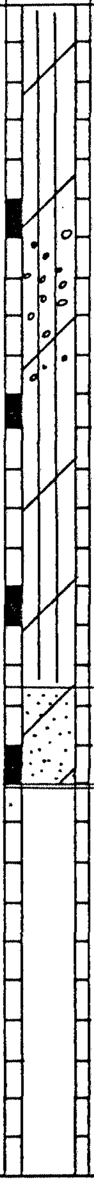
Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test		Sample Number	Depth in Feet	Boring Log	DESCRIPTION
				"C" k.s.f.	"ø" Degree				
									Black silty CLAY with desiccation cracks, loose, dry CI
104.3	22.0					4-1	5		changing color to brown and tan with caliche cementation, stiff, damp to moist ▼
									mottled brown and gray
88.4	34.8					4-2	10		stiff, moist ∇
									some caliche nodules
93.6	28.3					4-3	15		stiff, moist
									blue-green
98.4	27.5					4-4			Blue-green silty CLAY; * CL
									Boring terminated @ 19'

Remarks: *(old bay mud ?) traces of shell fragments and organics, stiff, very moist to wet

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: AR	EXPLORATORY BORING LOG	Hole No. B-5
Date Drilled: 6-17-80		Job No. 80-2007-S1



Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	DESCRIPTION
								Black silty CLAY with desiccation cracks, loose, dry CI
								stiff, damp
							5	changing color to light brown and tan with caliche, nodules and
112.0	16.3		14.0			5-1		cementation, stiff & dense, damp
								▼ to moist, some pea-gravel mottled brown and gray some fine-grained sand stiff, very moist ▽
							10	
88.8	33.8					5-2		changing color to blue-green
							15	
93.1	30.0					5-3		stiff, very moist
								Brown and gray medium-grained sandy CLAY, compact, wet CL
102.8	23.7	50				5-4	20	
								Boring terminated @ 20'

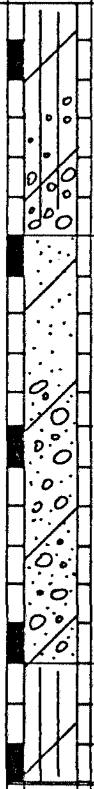
Remarks:

Log of Test Boring

UNITED SOIL ENGINEERING, INC.

Logged By: AR Date Drilled: 6-17-80	EXPLORATORY BORING LOG	Hole No. B-6

Job No. 80-2007-S1

Dry Density p.c.f.	Moisture Content %	Penet. Resist. Blows/ft.	Unconf. Comp. Strength, k.s.f.	Direct Shear Test "C" k.s.f.	Direct Shear Test "Ø" Degree	Sample Number	Depth in Feet	Boring Log	DESCRIPTION	
94.9	26.3					6-1			Black silty CLAY with desiccation cracks, loose, dry, stiff some pea-gravel changing color to light brown with caliche, nodules and cementation and gravel, dense	CI
							5			
103.6	19.8					6-2			Light brown medium-grained sandy ▼ CLAY, stiff and compact, damp to moist ▽ some gravel compact, dense, wet	CL
							10			
105.4	21.6	25				6-3				
									mottled brown and gray	
							15			
101.7	24.4	50				6-4			stiff and dense, wet	
									Dark gray silty CLAY;	CL
NO RECOVERY						6-5	20		stiff, very moist to wet	
									Boring terminated @ 20'	

Remarks:

Log of Test Boring

UNITED SOIL ENGINEERING, INC.